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ABSTRACT

A study evaluated the effect software for self-assessment and management of reading practice had on reading achievement and motivation in two primary schools in Aberdeen, Scotland. The program utilized was The Accelerated Reader (AR) which was designed to enable curriculum based assessment of reading comprehension within the classroom. Students using the program in both schools (Project A and Project B) read real books from a selection of 150 titles on the AR book list. Students then took tests consisting of multiple-choice questions on the computer which analyzed and summarized the results helping the teacher to manage effective reading practice. Quantitative and qualitative results indicated that even when less than fully implemented, the Accelerated Reader program yielded gains in reading achievement greater than regular classroom teaching and an alternative intensive method, even with less time devoted to class silent reading practice than in comparison classes. Results also displayed significant differences in attitudes to reading for boys and girls. (Contains 47 references, and 11 figures and 9 tables of data. Appendices present survey instruments, titles available for the UK version of the AR program, a sample at-risk report, problem types and possible causes (found on the at-risk reports), the color-coding system for Project A and Project B, student reading logs, the day-to-day reading process, Accelerated Reader shop prices, tables of data, and a follow-up study for Project A.) (Author/RS)

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EXPERIMENTAL EVALUATION OF COMPUTER ASSISTED SELF-ASSESSMENT OF READING COMPREHENSION:
Effects on Reading Achievement and Attitude

Stacy R. Vollands

(with K. J. Topping & H. M. Evans)

Report on a research project funded by the Nuffield Foundation of London and carried out at by the Centre for Paired Learning in the Department of Psychology in the University of Dundee, Scotland, at field locations in Aberdeen, Scotland.

June 1996

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TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION 7

Computers in Education 7
Computers and Reading 8
Attitudes and Motivation 8
Present Study 9
Overview 10

CHAPTER 2: LITERATURE REVIEW 12

Computers in Education 12
Computers and Reading 14
Attitudes and Motivation 19
Background to the Accelerated Reader 23
Accelerated Reader Studies 28

CHAPTER 3: METHODOLOGY 37

Context 37
Sampling Framework 37
Hypotheses 39
Research Design 40
Measurement / Instrumentation 42
Nature of the Intervention 49
Implementation 51
Data Analysis 55

CHAPTER 4: RESULTS 56

Quantitative Results 56
Qualitative Results 71

CHAPTER 5: DISCUSSION AND CONCLUSIONS 85

Project A 85
Project B 87
Relationship to Previous Literature 91
Alternative Explanations 93
Analysis of Methodology 97

CHAPTER 6: ACTION IMPLICATIONS 101

Cost-Effectiveness 101
Future Research 103

REFERENCES 105

APPENDICES 111

1 - Elementary Reading Attitude Survey

2 - Interest Survey

3 - Titles available for the UK Version of the Accelerated Reader

4 - Sample 'At-Risk' Report

5 - Problem Types and Possible Causes (found on the 'At-Risk' Reports)

6 - Colour-Coding System for Project A and Project B

7 - Student Reading Logs

8 - Duolog Reading Process

9 - Accelerated Reader Shop Prizes

10 - Tables 1-9

11 - Follow-up Study for Project A

LIST OF FIGURES

Figure 1 Project A: Experimentals (Shortened Edinburgh Reading Test) 56

Figure 2 Project A: Experimentals: Neale Accuracy (in months) 57

Figure 3 Project A: Experimentals: ERAS (by gender) 59

Figure 4 Project A: Experimentals: Interest Survey (by gender) 59

Figure 5 Project A: Neale Accuracy (in months) 62

Figure 6 Project A: Neale Comprehension (in months) 62

Figure 7 Project B: AR Experimentals (Shortened Edinburgh Reading Test) 64

Figure 8 Project B: AR Experimentals: Neale Comprehension (in months) 65

Figure 9 Project B: AR Experimentals: Shortened Edinburgh Reading Test (by gender) 66

Figure 10 Project B: AR Experimentals: ERAS (by gender) 67

Figure 11 Project B: AR Experimentals: Interest Survey (by gender) 67

LIST OF TABLES
(As found in Appendix 10)

Table 1 Pre-test scores for Project A: AR Experimentals vs. Control Group

Table 2 Post-test scores for Project A: AR Experimentals vs. Control Group

Table 3 Gender Differences for Project A: AR Experimental Group (Females vs. Males)

Table 4 Gender Differences for Project B: AR Experimental Group (Females vs. Males)

Table 5 Gender Differences for Project B: Alternative Treatment Group (Females vs. Males)

Table 6 Pre-test scores for Project B: AR Experimental Group vs. Alternative Treatment Group

Table 7 Post-test Scores for Project B: AR Experimental Group vs. Alternative Treatment Group

Table 8 Gain Scores for Project A: AR Experimental Group vs. Control Group

Table 9 Gain Scores for Project B: AR Experimental Group vs. Alternative Treatment Group

Experimental Evaluation of Computer-Assisted Self-Assessment of Reading Comprehension: Effects on Reading Achievement and Motivation

Stacy Rae Vollands

This study evaluated the effect software for self-assessment and management of reading practice had on reading achievement and motivation in two primary schools in Aberdeen, Scotland. The programme utilised was The Accelerated Reader (AR) which was designed to enable curriculum based assessment of reading comprehension within the classroom. Students using the programme in both schools (Project A and Project B) read real books from a selection of 150 titles on the AR book list. Students then took tests consisting of multiple-choice questions on the computer which analysed and summarised the results helping the teacher to manage effective reading practice. Quantitative and qualitative results indicated that even when less than fully implemented, the Accelerated Reader programme yielded gains in reading achievement greater than regular classroom teaching and an alternative intensive method, even with less time devoted to class silent reading practice than in comparison classes. The results also displayed significant differences in attitudes to reading for boys and girls.

CHAPTER 1

INTRODUCTION

Computers in Education

In reviewing the literature in reference to the use of computers in education it becomes evident that a plethora of information exists regarding the use of computers as a learning tool. Several terms emerge in describing computers as they are used for purposes of instruction, remediation and assessment within the classroom. These include computer-aided learning, computer-assisted instruction, computer-based assessment and Integrated Learning Systems (ILS), just to name a few. Not only are there are a variety of terms that exist, there are also a variety of opinions emerging (based upon the available research) as to the relative effectiveness of such systems within the educational realm. It is perhaps not surprising then that the increase in the use of computers in education has become a hot topic in recent years (Peak & Dewalt, 1993). Despite the academic debate that does exist, the use of computers within the classroom has become an integral part of many schools, with considerable learning gains being reported in a US context through their use (NCET, 1994a; NCET, 1994b; Hughes, 1995).

Some of the questions which people often ask in reference to computer-assisted learning include whether or not students make more progress using the computers than they would through more traditional models of instruction, whether progress is being made on the most important academic and curricular areas and whether or not the system is cost-effective (Becker, 1992). It is not possible to provide an all-encompassing response to these questions as so many software packages are now available for the computer, each one intended for different uses within the classroom. In addition, depending upon unique factors within any one classroom, these systems will be implemented with varying degrees of success based upon student and teacher motivation, management of the programme within the classroom, time devoted to use of the programme and so on. Research into the

effectiveness of individual packages is therefore crucial and may yield very different conclusions in order to attempt to answer these questions.

Computers and Reading

There are those who would argue that microcomputers within the classroom have served as an important instrument in the area of reading and will continue to have important future implications for the teaching of reading (Davidson & Noyes, 1995; Peak & Dewalt, 1993). The computer is not meant to be a replacement, in this respect, for good books or good instruction, according to Peak and Dewalt (1993) but rather, "computers can be used to augment basic reading skills rather than replace them, for there is no substitute for competent instruction" (p7).

A large number of studies exist in relation to computer-based reading interventions and these interventions vary greatly in terms of their outcomes. The computer is used, in this respect, for general classroom interventions or specifically for purposes of remediation with children who are having difficulties with reading. As a vast majority of the research in this area has involved 'failed readers', it is perhaps not surprising that the most consistent findings in reference to the benefits that computer-assisted learning can have are in the area of remediation (Davidson & Noyes, 1995; Peak & Dewalt, 1993; & Wepner, 1990). A great deal of the software available is designed for these purposes and focuses on the teaching and practising of various sub skills of reading.

Attitudes and Motivation

The literature maintains that when computers have been used within the classroom, improvements have been noted not only in terms of learning outcomes but also in non-academic areas as related to attitudes, motivation and even behaviour (NCET, 1994a). In fact, many studies have documented improvements in terms of motivation and attitudes

when computers are used within the classroom (Foot, Howe, Anderson, Tolmie & Warden, 1994; NCET,1994b; Self, 1985; Becker, 1992; Peak & Dewalt, 1993). It has also been acknowledged that performance on standardised tests should not be the whole picture in terms of measuring growth in reading (Taylor, Frye, & Maruyama, 1990) and that the affective components are also important to take into consideration. The issue of motivation and attitudes towards reading will also be a main focus of the present research. A discussion of motivation and attitudes as they relate to reading will first be discussed under the attitudes and motivation sub-heading in the literature review, followed by a brief look at these non-cognitive components as they are related to computers.

Present Study

The present study was undertaken as an experimental evaluation of one particular computerised assessment and management system (The Accelerated Reader - AR) in terms of the effects it had on reading achievement and attitudes towards reading. The objectives of this study were to examine whether or not significant gains would be evidenced in reading achievement as well as attitudes towards reading in experimental groups which would outweigh gains made in a control and an alternative experimental classroom.

This study is different from other research concerning the Accelerated Reader in that it analyses both reading achievement and attitudes. It also includes detailed implementation process data which is often lacking in other studies. In addition, this is the first official pilot evaluation of the Accelerated Reader in a UK context and it takes place in two schools which vary slightly in terms of the implementation of project design.

More research is still needed in evaluating the effectiveness of the Accelerated Reader with different age-groups and in different contexts before any firm conclusions can be made. However, it is hoped that this study will add some additional useful information with regard to the Accelerated Reader. In an age when the computer has come into the

limelight many questions have arisen as to its effectiveness within the classroom as an aid to learning. It is therefore important to continue to carry out research in the quest for the most effective computerised assessment and management programmes for use in the classroom.

Overview

The following chapter is the Literature Review section which commences with the general context of computer-assisted instruction. A review of the literature in reference to computers and reading interventions will then be given before moving on to a review of the literature as it pertains to attitudes and motivation in relation to reading and computers. The author then moves on to a more focused and detailed look at the specific intervention undertaken in the current research. This will include some background information about the Accelerated Reader as well as a review of the studies pertaining to the programme which have been carried out previously.

Chapter 3 is the Methodology section in which the reader will be introduced to the context for the study, the hypotheses generated, the research design, the subjects and the measurement and instrumentation utilised for this research. In addition, a section on the nature of the intervention has been included as well as a section devoted to the implementation of the Accelerated Reader in Project A and Project B. A section on the type of data analysis utilised has also been included.

Chapter 4 is the Results section which is divided into a quantitative section for both projects followed by a qualitative section. In the quantitative section, results are given for Project A (experimentals) followed by Project A (controls). A brief comparison between classes is then made. Quantitative results are then given for Project B (AR Experimentals) followed by Project B (Alternative Treatment Experimentals). A brief comparison between the groups is again made. Quantitative results are also provided in reference to

the process data concerning the implementation of the Accelerated Reader in experimental classrooms. This data is presented in a monthly diary format. In addition, information collected through discussions and interviews with students and teachers concerning the use of the Accelerated Reader in the classroom is also included.

Chapter 5 is the Discussion and Conclusion section where the hypotheses and the literature are re-visited based upon the results of the data analysis. Alternative explanations to the results are also provided as well as an analysis of the methodology utilised.

Chapter 6 on Action Implications, is the final chapter. This chapter discusses some ideas for further research. In addition, the issue of cost-effectiveness is also addressed.

CHAPTER 2

LITERATURE REVIEW

The literature pertaining to the general use and relative effectiveness of computers in education is wide and varied. It is therefore not the intention of the present author to address this topic in any detail but rather, mention the area briefly before moving on to a more detailed look at computers and reading interventions and attitudes and motivation as they are related to reading and computers.

Computers in Education

The use of computers in education has been growing at such a rate that it appears as though research is scarcely able to keep up. The research that has been done, however, is difficult to interpret as it covers such a range of conclusions based upon different software packages with divergent purposes. These packages are examined for research purposes with different populations of children for varying lengths of time and with varying quality of implementation within the classroom. There are individuals that would highly support and advocate the use of computers in the classroom (Hughes, 1995; Knight & Knight, 1992; Self, 1985 and Foot, Howe, Anderson, Tolmie & Warden, 1994). However, there are also those who feel that claims made in reference to computer-assisted learning are not entirely substantiated and merit further evaluation before any firm conclusions are made (Davidson & Noyes, 1995; Becker, 1992; NCET, 1994a). Reinking & Watkins (1996) also propose that in order to more adequately assess literacy acquisition through computer-assisted learning, new approaches to research are required.

With the many reports from the US concerning the usefulness of computers in education, the National Council for Educational Technology (NCET) in Britain set out to investigate the potential uses in the UK (Hughes, 1995). The NCET (1994b) reported that the use of computers for purposes of assessment had been developing steadily over the years to a

point where it was now time to move forward with "widespread introduction and development" (p14). At the time of writing, computer-assisted assessment is used in many educational environments within the UK for purposes which include: 1) recording and analysing student progress, 2) reporting on student achievement and 3) creating computer-generated tests (NCET, 1994b). Computer systems utilised for these purposes often combine computer-based management, teaching and assessment.

In a very thorough review of the literature concerning software projects which claim to manage student learning in the US, Becker (1992) concluded that evaluation data from studies carried out to that date was too weak to enable any firm conclusions by way of investment decisions for schools. He found the cumulative analysis of all available research difficult to interpret in terms of the general effectiveness of such computer-based programmes as many studies evidenced poor evaluation designs and inadequate data collection, poor descriptions of how the programme was implemented and poor analysis and presentation of results. However, Becker did acknowledge that students appeared to perform at least somewhat better when using these computerised systems, with high and low achievers benefiting the most.

Despite his very modest conclusions, Becker (1992) did provide some arguments why computer-assisted learning, management and assessment could be expected to be effective in improving student academic performance, especially in basic mathematics and language skills. He proposed that the computer should be effective due to: 1) the motivational nature of computer-based activities (referring to research that indicates that children do enjoy most computer learning activities), 2) 'centralised management functions' which allow the teacher more time to target specific students based on demonstrated need, and 3) how such systems can bring specific skill deficiencies to the attention of the teacher (p2). Peak & Dewalt (1993) further emphasised the importance of computer-based activities as enabling 'co-operation between users' which could provide the means for more specific

instruction, faster diagnosis of any difficulties and the development of higher-order thinking skills.

McFarlane (1995) also provided a review of the published literature regarding the implementation, use and effects of computer projects which claim to manage student learning, with an emphasis on their use in primary schools. She concluded that the majority of studies show a mildly positive effect on learning outcomes although very few studies included follow-up data, making it difficult to determine whether any gains made were sustained or even improved over time. She also commented that outcomes in reference to pupil ability, gender, time on the system and the role of the teacher had been variable and therefore difficult to interpret. She did conclude, however, that the results of the various studies seemed to suggest that the more time spent on the system, the greater the learning gains. In addition, she commented that proper implementation of the system as intended by the vendors was relatively uncommon and may have affected the results in many projects.

The way in which a particular computer-based learning system is implemented is crucial and this is believed to have some effect on the outcomes that the system has (Hughes, 1995; Reinking & Watkins, 1996). Knight & Knight (1995) also assert that computers can be an effective learning aid if implemented properly. They suggest that this would require, among other things, a positive classroom environment, children being empowered to be active in their own learning, effective classroom management techniques and new assessment devices to compensate for the present incompatibility that exists between computer-based learning and assessment techniques.

Computers and Reading

A variety of computer-based reading interventions can be found within the literature (NCET, 1994; Davidson & Noyes, 1995; Reinking & Schreiner, 1985; Reinking &

Rickman, 1990; Reinking, 1988; Reinking & Watkins, 1996; Goodman & Carron, 1994; Cutler & Truss, 1989; and Wepner, 1990) although extensive research on any one intervention is rare and difficult to obtain. These studies vary tremendously in terms of their quality, the length of implementation of the computer-based intervention, the purpose in implementing the programme and the results that are obtained.

In the studies listed above, there are those which focus on the computer as a remedial tool for reading (Cutler & Truss, 1989; Wepner, 1990; Davidson & Noyes, 1995), whereas others focus on the use of computers with mixed populations of good and poor readers in increasing independent reading (Reinking & Watkins, 1996) or improving reading comprehension, accuracy or rate (Reinking & Schreiner, 1985; Reinking & Rickman, 1990; Reinking, 1988; Goodman & Carron, 1994; and NCET, 1994a). Some studies reveal positive learning gains (Reinking & Schreiner, 1985; Goodman & Carron, 1994), while others reveal no significant learning gains (NCET, 1994a; Davidson & Noyes, 1995). Additionally, gains in motivation and attitude (NCET, 1994a) as well as in self-esteem (Goodman & Carron, 1994; NCET, 1994a; Wepner, 1990) have been documented as a result of computer-based reading interventions.

With all of the information available in reference to computer-based reading interventions and the great variety in this research, it is difficult to make any firm conclusions about the use of computers in reading. However, a brief look at a few of the studies mentioned above may add some interesting background information for the reader in terms of how the computer has been used as a learning tool in relation to reading.

In 1994 the National Council for Educational Technology (NCET) was commissioned to do a pilot study investigating if and under what conditions a particular type of computer-aided learning system called an 'Integrated Learning System' (ILS) would be effective. An ILS is a term used to describe a range of software products which include: 1) curriculum-based material, 2) a student record system, and 3) a management system to measure

student learning. In their six month study, two systems were utilised, one of which was reading-based (Success Maker).

This evaluation was carried out in 12 schools (4 primary and 8 secondary) in Northern Ireland, Scotland, Wales and England. The two main aims of the study were to determine: 1) whether any learning gains emerged due to the computerised reading programme, and 2) whether changes in motivation and attitudes towards learning would emerge. Students in control and experimental classes took standardised tests as a measure of reading ability at pre- and post-test. In addition, attendance was monitored and attitudes were measured at the beginning and end of the project. Additional qualitative data included observations, recording of students' perceptions of their work and comments made from classroom teachers. Results (which are taken at face value as no quantitative or qualitative data are provided in the NCET report) indicated that there were no significant differences in terms of reading test results between the experimental and control groups over the six months, although positive changes in terms of attitudes, motivation and behaviour were evidenced. It was also noted, however, that the lack of quantitative learning gains did not match up with the perceptions of pupils and teachers. A discrepancy between quantitative and qualitative data could perhaps raise questions about the sensitivity of the measures used. One may also question whether the intervention period was too short to adequately assess gains from the use of the computer. In searching for possible explanation for their results, the NCET suggested that studies in the US concerning the use of such systems had found gains in reading achievement to be small if not unrecognisable after only six months. Becker (1992) suggested that only a small effect may be expected after an entire year of using such systems. Hughes (1995) mentioned that the results of the NCET study were encouraging yet far from conclusive. He further maintained that the results did not definitely prove the educational benefits of such computer-based programmes but that they did appear to motivate and encourage pupils to be responsible for their own learning.

Davidson & Noyes (1995) conducted an evaluation of a computer-based system for the teaching of reading which involved computerised speech feedback at the user's request. Subjects for this study included a small sample of 10 children (6 boys and 4 girls), 5 of whom were allocated to the experimental group and 5 to the control group. All of these children had experienced 'some failure in learning to read'. At the end of the 4 week intervention period, no significant differences were found on standardised tests for the experimental group. However, the total gain for the intervention group was slightly higher than the control group. Yet, one may question the very short duration of this evaluation when looking for gains in reading for children who have more than likely been experiencing difficulties for quite some time. Would greater gains have been evidenced over say a 6-month or even a year-long intervention period?

Goodman & Carron (1994) presented background information in reference to a computer-assisted reading recovery programme for BBC computers which is marketed by Carron Practicals. When using this system, children pre-read chapters of a book on a screen and unfamiliar words were enunciated by the computer at the child's request. The child was then presented with this material a second time, at a pace determined by the computer to be appropriate for the child. Auditory support (through computerised voice feedback) was also provided for words that were found difficult at the first reading. The child was then given a multiple-choice test and printed reports were provided based upon the child's performance. In addition, daily word lessons were given so that both the 'whole language' and the 'phonics' approach were combined within one programme. There are some very strong claims made about this computer-based reading recovery programme by the vendor without any reference to relevant research. For example, Carron claims that substantial gains in reading are evidenced in only one academic term and that reading age will "catch up" with chronological age within one academic year. In addition, she claims that massive improvements in self-esteem are also witnessed in only two weeks. This sounds wonderful but it would be useful to know how these conclusions were made. In saying this, however, there are two pilot studies which are included in this article which were undertaken by

Goodman. She worked with children who had a variety of reading abilities, including a few children who had 'Statements of Educational Need'[1]. In pilot A, 14 children utilised the programme for a 5-week period. In pilot B, 31 children utilised the programme for 13-18 weeks. In pilot A, Goodman stated that the average improvement within the group was 4.57 months. However, in analysing her calculations, it becomes evident that her arithmetic was inaccurate. If anything, gains would have been slightly higher had this been done properly. Likewise, in Project B, she noted an average gain of 9.9 months, although her calculations were again inaccurate, resulting in an underestimation of gains. Nonetheless, these results seem quite encouraging. It would be interesting to find out whether these gains were sustained over time and whether or not the results could be duplicated in other schools and with different groups of children.

Cutler & Truss (1989) conducted an intervention using computer-assisted instruction in reading for "reading deficient" teenagers over a five-week period. The computer was utilised as an 'aid' to help compensate for inadequate sight vocabularies in five, eighth and ninth grade students from a remedial reading class. A grid and a 'stylus pen' were provided for the pupils, who were then able to touch an unfamiliar word in the novel they were reading in order to hear the word, as well as a synonym for it. Short vocabulary tests were given from the Iowa Basic Skills Test before and after the intervention, although there is no indication of any pre- or post-test results in the report. Results indicated that during this short intervention, which included only a small number of subjects, reading rate increased significantly, word requests decreased and 'persistence' in reading increased. Cutler & Truss concluded that the system was successful in keeping students motivated to read, as it enabled them to read age-appropriate stories and kept the flow of reading moving so that they could enjoy the story.

[1]This is the English equivalent of the 'Record of Needs' in Scotland and in a US context, would describe children who require special education.

Attitudes and Motivation

The importance of the affective components in reading (i.e. interests, attitudes and motivation) is now recognised by many within the literature as being linked in some way to reading achievement (Heathington, 1979; Greaney & Hegarty, 1987; Anastasi, 1988; McKenna & Kear, 1990; Rowe, 1991, Saracho & Dayton, 1991; Shapiro & White, 1991; Allen, Cipielewski & Stanovich, 1992; McKnight, 1992; Cameron & Pierce, 1994; Ley, Schaer & Dismukes, 1994; Chapman & Tunmer, 1995; Yelland, 1995). Until recently, the literature tended to avoid the affective components as it was felt these areas were "difficult to conceptualize, measure and address instructionally" (McKenna & Kear, 1990, p626). Researchers have acknowledged the previous neglect of the factors of motivation and attitude as related to reading achievement (Ley, Schaer & Dismukes, 1994; Shapiro & White, 1991). These authors stress that this neglect has emerged: 1) due to a lack of interest, 2) out of the socio-political pressure placed upon other cognitive domains in reading as more pressing for researchers, 3) owing to the perception that attitudes are private and not in the domain of the school, and 4) that very few "recognised" instruments for measuring attitude toward reading exist. However, despite the difficulties in measuring the non-cognitive components involved in the reading process, achievement and attitude have been consistently linked within the literature (McKenna & Kear, 1990; Rowe, 1991), although very little is known regarding any causal links between the two.

In reviewing the literature, it becomes evident that a variety of instruments to measure interests, attitudes and motivation result in a variety of different conclusions in reference to these different sub-divisions of the affective components. Most of these scales have been developed for use in particular research projects (Anastasi, 1988) and certainly many of them are of questionable reliability and validity (Topping, 1995). However, in summarising the main themes that emerge from these studies of various quality, it appears as though attitudes toward reading and motivation to read may be affected by the type of instruction in the classroom (Shapiro & White, 1991), the importance of book self-

selection in motivating children to read (Ley et. al, 1994; Topping, 1995; Heathington, 1979), age of the child (Shapiro & White, 1991; Ley et. al, 1994), levels of perceived or actual reading achievement (Greaney & Hegarty, 1987; Ley et. al, 1994; Saracho & Dayton, 1994; Chapman & Tunmer, 1995; and Rowe, 1991), interests and leisure-time activities (Greaney & Hegarty, 1987; Allen et. al, 1992), parental involvement and reading activity at home (Topping, 1986; Rowe, 1991; Greaney & Hegarty, 1987; Ley et. al, 1994), intrinsic versus extrinsic motivation (Cameron & Pierce, 1994) and gender (Shapiro and White, 1991; Ley et. al, 1994). It is not the intention of the present author to go into a detailed analysis of each of these studies. Instead, a few studies will be mentioned in reference to the findings within this literature as they relate to the present research in the Discussion section. The present author will now look briefly at how attitudes and motivation have been discussed in reference to computers within the literature.

In the previous section, Becker (1992) was cited as noting that improved academic performance could occur, at least in part, due to the motivational nature of computer-based activities. Additionally, the NCET (1994a) study found changes in attitude and motivation after the use of a computerised reading management intervention. Cutler & Truss (1989) also felt students were more motivated to read after working with the computer. A few additional studies are included here for reference.

Wepner (1990), in her study of 85 "At-Risk" eighth graders, attempted to address what it was about the computer that motivated students. Her project consisted of a 1-year long computer-based reading intervention with 85 students in the eighth grade who qualified for support services to help them succeed in school. During the intervention period, only qualitative data was collected. This data included observations of the pupils in the computer lab and a study of individual pupil's reactions to each computer session as recorded in individual diaries. Wepner noted, at the end of the intervention period, that all but one of the students enjoyed working with the computer. Students felt the computer activities were fun and they enjoyed having control over the machine and being able to

work at their own speed. In addition, she found that the pupils evidenced increased attention spans, improved self-discipline and general excitement. She also identified needs which students may have that could potentially have been met by the computer-based intervention, therefore acting as powerful 'motivators'. She saw these as: 1) cognitive needs which could be met by a system which facilitates comprehension, 2) affective needs which could be met by providing books for the students that would interest them and entice them to read, 3) procedural needs which could be met through clear, specific, step-by-step instructions on the computer, and 4) psychological needs which could be met when the software contained immediate reinforcement, personalised lessons and self-correcting strategies.

McFarlane (1995) also discussed the issue of attitudes and motivation when using computers. She referred to studies in the US and Israel by Hativa (1989) in which 70-75% of students enjoyed working with computers, while 15-20% did not. There is no indication, however, of the age group of children included in the study or how many were surveyed. These studies also found that when the computer provided positive responses, this was seen as motivating for children, whereas negative responses to incorrect answers were seen as discouraging. In other words, children liked it when they got something right and were so informed by the computer, but did not like being informed that they had done something incorrectly. This study also concluded that 92% of high achievers enjoyed the work on the computer, while 87% of less able students indicated enjoyment. McFarlane also referred to studies by Hoorvitch-Steimberg (1990) and Clariana (1993) in which student attitude and motivation was affected in a positive way by certain aspects of the computerised programme, such as the production of individualised reports by the computer. The Clariana study also noted that if children received regular feedback from the computer they displayed increased motivation as indicated by attendance rates. Interestingly, it was noted that this motivation was significantly greater for females than for males.

Gender Differences

Gender differences in reading achievement and attitudes toward reading have been cited in the research literature for a long time, with differences in the elementary school tending to favour girls (Shapiro & White, 1991). Ley, Schaer & Dismukes (1994) also cite many studies in which girls have been found to uphold more positive attitudes than males, although their own study found no significant differences between males and females. Greaney and Hegarty (1987), in a study involving 128 fifth-grade pupils, found that attitude toward reading correlated highly with gender, with girls spending more time reading books for leisure than boys. The research in this area is not conclusive, however.

The studies that discuss attitudes and motivation specifically in reference to computers as they relate to gender are also varied and do not yield any firm conclusions. Foot et. al. (1994) claim that recent studies in the UK suggest that boys have more positive attitudes towards computers than girls. They also found no significant differences in terms of cognitive outcomes from girls and boys, although significant differences were apparent in terms of affective issues, with girls performing better than boys. These authors further suggested that there was evidence to show that girls had increased self-perceptions after using the computer, whereas boys actually had decreased self-perceptions. However, Yelland (1995) conducted a study in which 30 boys and 30 girls aged 7 years were asked questions in reference to their ideas and attitudes towards computers, their ownership of and experience with computers, as well as their view related to sex-stereotyping (i.e. whether boys enjoyed computers more than girls). Results indicated that all children liked and felt good about using the computer. Yelland concluded that the positive attitudes that these girls and boys had might highlight the important role computers could take in the learning process. In a study by McKnight (1992), there was also evidence to suggest that improvements in attitudes and motivation to read emerged for both boys and girls after the

use of a computer-assisted management and assessment package (The Accelerated Reader).[2]

Background to the Accelerated Reader

The Accelerated Reader computerised reading management system (Advantage Learning Systems, 1986) was designed for use in schools with children and young people aged 8-18. It is now currently being used in 22,000 schools in the USA and is part of a wider school development programme known as "Reading Renaissance". Gains in reading achievement as well as motivation to read have been reported by many educators who are currently using the Accelerated Reader as part of the "Reading Renaissance" programme (Institute for Academic Excellence, 1995a, 1995b, 1996a, 1996b and 1996c).

The Accelerated Reader was designed to enable curriculum-based assessment of reading comprehension. Students read literature-based books at their own pace and take multiple choice comprehension tests on the computer upon completion of each book. The computer then scores the test, analyses and summarises the results and keeps records in an attempt to help the teacher and the student manage reading practice. The immediate feedback that children receive in reference to their performance is designed to motivate children to read more as well as longer and harder books.[3] Paul, Topping & Schnick (1995) explain how the objectives of the programme aim to: 1) improve reading comprehension, 2) develop independent, self-directed readers and learners, 3) contribute to the development of critical thinking skills, and 4) attempt to make reading fun as well as to work toward instilling a life-long love of reading in children (p23).

The philosophy behind the Accelerated Reader incorporates a mixture of theories concerning the development of language. These include cognitive models and

[2]The McKnight study will be discussed in more detail in the Accelerated Reader Studies section.
[3]A more detailed look at the Accelerated Reader will be presented in Chapter 3 under the Nature of the Intervention section.

sociolinguistic models as well as the psychological framework for the development of language (Paul, Topping & Schnick, 1995). It is the latter of these which develops, in particular, from the work of Vygotsky. It is beyond the scope of this paper to explain each of these theories in detail. However, it may be useful to now mention how the Accelerated Reader incorporates some of these theories. It must also be mentioned that it is not the intention of this author to either support or refute the theories behind the Accelerated Reader but rather to mention them as an aid to the reader's understanding of the programme.

Paul (1996) found in his research that the problems inherent within school reading programmes included: 1) too little time devoted to reading each day, 2) not enough attention given to 'reading to' and 'reading with' children, and 3) the lack of clear guidelines for teacher intervention or student accountability with regard to reading. Each of these areas is addressed within the Accelerated Reader programme and can be illustrated through Paul's "theory of reading practice".

Theory of Reading Practice

Paul's (1992, 1993) "theory of reading practice" has two main themes. First, Paul maintains the more one reads, the better one reads. Secondly, the theory predicts that reading practice will result in different types of gains depending on reading ability and age. This would mean that "incremental amounts of reading practice" will cause more reading growth in poor readers than good readers. In other words, a good reader would have to read much more than a poor reader in order to achieve the same amount of achievement as the poor reader.

Many reading experts as well as teachers and parents would agree that time spent reading is related to reading growth (Taylor, Frye & Maruyama, 1990). Yet, there are very few studies in the literature that have found a relationship between time spent on silent reading and reading achievement (Paul, 1996, Taylor, Frye & Maruyama, 1990). One of the

difficulties with making any firm conclusions about the amount of reading practice that takes place in schools is the difficulty in measuring it. Paul (1996) maintains that the methods for measuring the amount of reading done (i.e. direct observations, counting the books pupils claim they have read, and analysing student time logs of recorded time spent reading) are all inaccurate ways of measuring the quantity of student reading. Paul emphasises that in order to know if a child has truly read a book, the child must have processed the words sufficiently enough to be able to recall important events when tested.

Paul maintains that the use of the computerised reading management system (The Accelerated Reader - AR) can provide a measure of literature-based reading through the measurement of Accelerated Reader points. (AR points will be explained in more detail below.) According to Paul, AR points are "a fairly accurate measure of the quantity of words being read and comprehended, and therefore, an accurate measure of reading practice" (p6). However, Paul also acknowledges that the Accelerated Reader only measures part of the total literacy environment within the classroom (that reading done on the Accelerated Reader books).

Children gain reading points on the Accelerated Reader according to their performance on computerised tests. The point value of each book is determined by the number of words in the book as well as the difficulty level of the book. Each book has a standardised reading level which is based on its readability. The readability of the book is determined through a 'computer-generated' formula that is based on the 1968 Fry Readability Formula (Paul, 1993). The formula used to calculate point value is displayed here:

$$\text{AR points} = (10 + \text{Reading Level}) \times \frac{\text{(Words in Book)}}{100{,}000}$$

The calculation of a "reading level" for each book ties in with another aspect of the "theory of reading practice" and that is Vygotsky's "zone of proximal development" (Paul, Topping

& Schnick, 1995; Paul, 1996). Vygotsky proposed that all people have a limit to language learning, known as a 'language ceiling', just below which there is an important zone of language development that is best for language learning. In order to learn most efficiently and effectively, language should not be too hard or too easy (Paul, Topping & Schnick, 1995). When applying this theory to the Accelerated Reader, the child should be guided by the classroom teacher to choose an AR book at a reading level that will promote maximum development during reading practice. This would be a book that would challenge the student with exposure to new vocabulary and concepts yet not contain so many new words and concepts that frustration develops (Paul, 1996).

The second problem which Paul emphasised was that not enough attention was given to 'reading to' and 'reading with' children in school. Paul and his colleagues therefore advocated a model for the full implementation of the Accelerated Reader in which 'optimal development' for children in reading would emerge out of 'reading to' children, 'reading with' children and 'independent reading'. They often refer to this model as 'TWI time'. When using the Accelerated Reader in the classroom, independent reading is undertaken through Sustained Silent Reading (SSR time), in which pupils read a book of their choice, quietly and for an agreed period of time each day. For those pupils who have difficulty with independent reading, reading to and reading with children is also recommended, not only as a way to support the less experienced reader but also to develop the importance of reading as a social experience (Paul, Topping & Schnick, 1995). It is believed that in order for a child to make the transition from an "emerging reader" to an "independent reader" it can be useful for the child "to receive some one-on-one tutoring or some type of coaching or assisted reading" (Schnick, 1995). Two of the ways in which this has been integrated into the Accelerated Reader programme are through "class serials" in which the classroom teacher reads an Accelerated Reader book to children (Paul, Topping & Schnick, 1995) and through Paired Reading (Topping, 1995; Paul, Topping & Schnick, 1995).

Paired Reading

Paired Reading (or 'Duolog Reading', as it is known as part of the Reading Renaissance programme) is a technique which involves more able readers helping less able readers with their reading. It has origins in behavioural psychology and includes participant modelling and positive reinforcement (Topping, 1995). The technique is intended to manage 'surface reading behaviour' and is in no way meant to interfere with the reading programme already in existence within the child's classroom. The focus on surface reading behaviour leaves the responsibilities of teaching the technical aspects of reading (i.e. phonics) to the classroom teacher.

The technique itself involves two main components, that of 'reading together' and 'reading independently'. Topping (1995) explains how initially a lot of reading together will probably take place. As the 'tutee' improves and becomes more confident, more independent reading will occur. The recommended practice time for Paired Reading is frequent but of short duration (i.e. 5 minutes per day for 5 days a week).

When combined with the Accelerated Reader, the process of Paired Reading (or Duolog Reading), described only briefly here, involves the 'tutee' selecting a book of interest from the Accelerated Reader book list. This book may be above the child's independent reading level but must not be too difficult for the tutor (Paul, Topping & Schnick, 1995). The pair then begin reading together with the tutor adjusting his or her pace to that of the tutee's. When the tutee feels comfortable enough to read alone, a pre-arranged signal will indicate to the tutor that the tutee wants to continue reading unaided. If while reading alone the tutee comes to a word that is either read incorrectly or is too difficult, the tutor will wait for four seconds and then provide the correct word. When this occurs, the pair then continue reading together. The pair continue, cycling from reading alone to reading together and back again. When the book has been completed, the tutor and the tutee may take the test on the Accelerated Reader that corresponds with the book read.

The superabundance of studies involving evaluations of the Paired Reading technique as well as various sub-components of the technique (i e. reading alone or reading independently) have yielded various findings. This is due, in part, to the wide range of quality in the studies (with projects undertaken utilising various sample sizes and various intensive periods), the degree of implementation and the degree to which the process of Paired Reading has been carried out correctly. There are, however, some very strong indications throughout the literature that Paired Reading does result in greater confidence (shown through fewer refusals), greater accuracy (with fewer errors made), better phonic skills and a greater likelihood of self-correction in reading (Topping & Lindsay, 1992).

Accelerated Reader Studies

There are very few studies that have been carried out in reference to the effectiveness of the Accelerated Reader in terms of learning or motivational outcomes. In fact, the present author could locate only one published, independent study (Peak & Dewalt, 1994), two unpublished papers (McKnight, 1992; Peak & Dewalt, 1993) and three unpublished, large-scale correlational studies (Paul, 1992, 1993, 1996).

Peak & Dewalt (1993, 1994) undertook a longitudinal evaluation over five years investigating the effects the Accelerated Reader had on reading achievement. Their subjects were a very select group of 50, ninth-grade pupils taking college preparatory classes (25 from each of two different schools that were similar in terms of demographics and curriculum expectations). One school used the Accelerated Reader during the intervention period and the other did not. They compared the total Children's Assistance Trust (CAT) reading scores of these pupils when they were in the third, sixth and eighth grades.

Results indicated that the experimental group improved an average of 18 points yearly from the third to the sixth grade and 8.5 points each year from the sixth to the eighth grade

whereas the controls improved only 10.3 points yearly between the third to sixth grades and 4.0 points yearly from the sixth to the eighth grades. A multiple regression analysis identified each child's third grade CAT score and his or her participation in the Accelerated Reader study as being significant predictors of final CAT scores. It also appears as though the experimental pupils were motivated to read more (an average of 5-6 hours per week) when compared with pupils in the control group (average of 2-3 hours per week), although there is no indication of how this was measured. In terms of students' reactions to the programme, comments made included that students felt the Accelerated Reader: 1) helped them to read more and better books, 2) increased their vocabulary, 3) that the system was fair and accurate, and 4) they enjoyed being provided with immediate reinforcement.

Peak and Dewalt (1993) made cautious as opposed to over-zealous conclusions based upon their study. They concluded that the Accelerated Reader system had some direct effect on the mean CAT scores over the intervention period. In saying this, however, a few critical points must also be mentioned. This study took place over a five year period with a very selective population of ninth-grade pupils who had intentions of attending further education. Although greater gains were made by the experimental group from the third to sixth-grade and from the sixth to eighth-grade, there is no acknowledgement or discussion concerning the fact that yearly point gains in the experimental group slowed down more than controls (i.e. 18 points gain each year in the third to sixth grade to an 8.5 point gain each year, a loss of 9.5 points on average in contrast to the controls who evidenced a 10.3 point gain each year that fell to a 4.0 point gain each year, a loss of only 6.3 points on average). Was the decrease in point gain due to a plateau being reached in each school? Had the 'novelty effect' of the computer worn off for those using the Accelerated Reader in the experimental group? One could also be led to ask whether or not the Accelerated Reader programme was implemented in the same way during all five years of the project. As there is no detailed process data, this is difficult to determine. It would have been interesting to know the extent to which any intervention was taking place by the classroom teacher using the diagnosis and intervention tools with which the

programme comes equipped. Additionally, no information is provided concerning the CAT reading test in terms of its reliability and validity or in terms of what the "gain points" represent. Were these gain points age related? How much of a gain would have been expected when taking natural maturation into consideration?

The study by McKnight (1992) is very different from the Peak & Dewalt study in that it did not focus on quantitative test data but rather evaluation took place through the use of observations, surveys, questionnaires and subjective reports by four teachers as to the academic performance of pupils. In addition, this study focused on an at-risk population as opposed to pupils who were achieving at least within the average range as in the Peak & Dewalt study. The goal of the McKnight study was to use the Accelerated Reader to improve the reading attitudes of 17 fifth grade pupils who attended Chapter I remedial classes by getting them to read more and better books as well as to engage them in reading for pleasure during leisure-time.

Results indicated that the use of the Accelerated Reader did positively affect the attitudes of those involved in the study. McKnight summarised that nearly all of the results from the various measures utilised (with the exception of the survey to see if television viewing time had decreased) were sufficient to meet her anticipated outcomes, although it is not clear how these outcomes were determined. At the completion of the study, she found that 10/17 children had kept an accurate daily log of their reading, 4/17 had reduced their television viewing to 1/2 the time spent before the project, 12/17 had set reading goals which they followed, 14/17 checked out books to read for pleasure , 10/17 checked out books at least twice a week, 10/17 reported seeing their parents read and enjoyed being read to and 14/17 evidenced good behaviour during Sustained Silent Reading time. McKnight concluded that, although there was not a significant reduction in television viewing time at the end of the project, other measures indicated that children's attitudes and enthusiasm for reading had improved. Although these results appeared encouraging at

first glance, the present author would like to suggest that the information should be interpreted cautiously for a number of reasons.

In this study, there were many intervening events taking place quite apart from the use of the Accelerated Reader in order to provide incentives to read. These events included such activities as poster contests, "show and tell" (where children would explain their favourite book to other children), the creation of rap songs based upon reading done, students reading to younger pupils, reading buttons made based upon story content, parental involvement at home (reading 'to' children), morning broadcasts in which children spoke about the various books they had read, and so on. With so many events occurring it was not possible to control for the effects these activities, quite apart from the Accelerated Reader, had on attitudes towards reading. In addition, the methods of measurement utilised to determine gains were of doubtful reliability. As there was no mention of reliability or validity of these measures, one could perhaps question the results as measured by these instruments. Even the results of "test data" relied only upon the subjective opinions of four teachers as to the performance of pupils as opposed to any direct quantitative measure of pre- to post-test gains. Additionally, this study took place over a 12-week period of time and no comparison group was utilised. It would have been interesting to see how the attitudes and motivation of children in the Accelerated Reader project compared with other children not using the programme. It would also have been interesting to see whether the perceived attitudinal gains were sustained over time. There is also little mention of the Accelerated Reader programme itself in terms of how well it was implemented, whether or not teachers intervened based upon reports generated by the computer and how well students performed on the Accelerated Reader tests. If the pupils were truly interested and motivated to read, would this not also be evidenced to a certain extent in the quality of their reading as opposed to just how many books they checked out or how many they purport to have read, based upon reading logs?

Paul (1992, 1993, 1996) undertook yet another type of evaluation through his three large-scale correlational studies. The 1992 study was an evaluation designed to test the effectiveness of Paul's "theory of reading based practice" - an analysis of how literature-based reading can significantly improve reading ability. Data from test results of 4,498 students (ranging in age from 6-16) in elementary and middle schools were submitted by teachers from 64 different schools. This data was then analysed using a pre- to post-test design. It is not clear, however, how the schools compared with respect to other US schools with regard to socio-economic status, rural/urban mix and the like. Additionally, it is not known whether or not the test results obtained from different schools were from similar or different tests. It is also not known how much time was devoted to reading in class each day in each of the schools or how the programme was implemented in each of the schools, as no implementation data is recorded.

Information derived from the data included: 1) age in years at pre-test, 2) a deviation score which suggested the amount by which a student's reading ability deviated from the child's grade level, 3) reading growth based upon gains from pre- to post-test, and 4) an estimate of a child's actual score for those scoring the maximum of 12.9 years on the tests. The students were then placed in sub-groups based upon reading ability (low, average and high) and chronological age. Accelerated Reader points (independent variable) were regressed (using the least squares method) against the reading growth made from pre- to post-test. Reading growth was measured through changes in grade level reading scores from 1990 - 1991. Predictions were then made as to the dramatic gains that could be made if certain point values were attained. Paul also made predictions about the impact that an additional hour of reading practice would have on reading growth. In doing so, Paul utilised a small sample (n=30) in comparison with the numbers used in the rest of the study to analyse the amount of time it takes to accumulate reading points. It is unclear, however, for what length of time children recorded this information, how they were selected or what 'ability groupings' they represented.

From the results of this study, Paul concluded that his "theory of reading practice" was proven. He also concluded that reading points, as measured by the Accelerated Reader, were a good measure of reading practice, as predicted growth in years was seen to increase as the number of points increased. Paul also implied that a programme such as the Accelerated Reader, which utilises literature-based reading, can improve reading ability dramatically, especially for average and below-average students. Although predicting high gains with an increase in reading time each day, he further concluded that a school should focus primarily on achieving a certain number of points on the Accelerated Reader. If this was done, it was asserted that reading growth would definitely follow. Yet, are there no possible exceptions to this? What if a pupil reads a large number of lower point books that are below the child's independent reading level just to earn a lot of points. Would this child evidence great reading gains? Also, the results accumulated do seem to be encouraging, yet the conclusions made are based upon predictions which, one may argue, need to be tested and supported by further research. However, even within a research project, it is questionable whether these predicted levels of growth are actually attainable due to the inevitable variation in project implementation.

Paul's 1993 study was also designed to validate his "theory of reading practice" and can be seen, in this sense, as an extension of his 1992 study. More specifically, the study was undertaken to display the impact that literature based reading had on reading and maths ability when using the Accelerated Reader. For the purposes of this review, however, only information within the study related to reading will be included.

The 1993 study was twice as large as Paul's earlier study, with data from 10,124 students in the first through ninth grades being submitted by teachers from 136 schools using the Accelerated Reader programme across the United States. Unfortunately, 12 different standardised tests were utilised, so even though each school used the same test from pre- to post-test this may raise concerns in reference to the true comparability of test data from school to school. Data was divided in a similar way to the 1992 study, with the exception

that groups were divided according to ability quartiles based upon percentages as opposed to grade-level ability obtained on the post tests. Data were then subjected to a multiple linear regression with both points and percentile scores as independent variables and predictions were made in reference to the impact that 100 points of literature-based reading would have on improving reading percentile scores.

Paul concluded that the "theory of reading practice" was again validated. However, the present author would tend to a more conservative interpretation. In analysing the data presented it appears that one could conclude that younger and poorer readers improved more in terms of percentage points from pre- to post-test than older and more accomplished readers. In addition, with some exceptions, there does seem to be a trend in the predicted improvement statistics with lower ability readers having higher improvement predictions than higher ability readers. Again, these predictions would need to be validated through research, preferably in schools where identical standardised tests were utilised across schools and where the implementation of the Accelerated Reader had been analysed in terms of the degree of use within the school across classes and grade levels. It may also be useful to analyse the motivation of teachers within the project and the attitudes of pupils toward the Accelerated Reader as these factors may have an effect on the data.

Paul (1996), in another very large-scale study, examined data from 659,214 students in grades K-12 from 2,193 different schools across the United States for the 1994-95 academic year. The computer-based assessment and management programme (The Accelerated Reader) was again used to measure literature-based reading practice. The objectives of this study were to analyse the effects that differences in reading practice (as measured by AR points) had on different groups of students from different types of schools. Paul sought to observe patterns in the amount of reading done depending on the state the child lived in, the size of school (large versus small) and the type of school (public versus private). In addition, Paul wanted to see in which grades students read the most, in which the least and how much variation there was between high and low performing

students in terms of reading practice. Surveys were sent out to schools in order to collect data on the number of points earned using the Accelerated Reader in each school. Data from the 1992 and 1993 studies were also re-analysed to see if any patterns emerged for 'low' and 'high' performing students in terms of the amount of reading practice done.

Paul concluded that: 1) reading practice in school declined greatly after the fifth grade, 2) students in the top 5% (in terms of the amount of reading they do) read 144 times more than students in the bottom 5%, 3) reading practice varied with the size of the school, 4) reading practice varied with the type of school (public versus private), and 5) schools which were known to be 'high performing' states in terms of reading achievement evidenced 59% more reading practice than 'low performing' states (p3).

In looking at the results and conclusions from Paul's studies one must also take into consideration that the literature-based reading data presented here is very specific and includes only those books read that are on the Accelerated Reader book list. Other types of reading practice are not included. In looking at the conclusions made then, Paul's data would seem to suggest that in terms of the reading practice by grade, the amount of literature-based reading of Accelerated Reader books (as measured by Accelerated Reader points) did increase from Kindergarten to sixth grade and then declined. In addition, fourth and fifth grade students appeared to be reading the most Accelerated Reader books and therefore taking more tests on the computer, although these pupils averaged only 12.8 minutes of Sustained Silent Reading per day. In addition, the average amount of reading practice on Accelerated Reader books for all grades was found to be only 7.1 minutes. The data also showed that the Accelerated Reader was more effective (in terms of getting students to read more) the longer the programme was in the school. The data also suggested that the type of school affected the amount of time devoted to the Accelerated Reader, with private (fee-paying) schools evidencing more reading practice on Accelerated Reader books than public schools. Additionally , Paul asserted that small schools devoted more time to reading Accelerated Reader books and taking tests on the computer when

compared with larger schools (although the figure corresponding with this information illustrates the opposite). Paul also compared the "reading practice data" of a 3,000 student sub-sample with the 1994 National Assessment of Educational Progress (NAEP) study that ranked states according to reading achievement. Paul did this in order to see if there was a relationship between the rankings and the amount of Accelerated Reader practice. He found that those states that had been ranked as 'high performing' by the NAEP had the highest average of Accelerated Reader reading points per student. Data from the 1992 and 1993 studies by Paul were also re-analysed in terms of the amount of Accelerated Reader points that 'high' and 'low' performing pupils had accumulated. The results indicated that 'high performing' pupils were reading Accelerated Reader books 3.4 to 4.1 times more than 'low-performing' pupils using the Accelerated Reader. Paul uses these results to advocate the importance of 'substantial in-school reading practice' in order to boost reading performance.

CHAPTER 3

METHODOLOGY

Context

This study took place in two primary schools in Aberdeen, Scotland. School A was located in the Torry area of Aberdeen, a deprived, inner city location that contained mainly rented public (or state) housing residences. Many of the children at the school came from single-parent families. The school roll was approximately 230 pupils at the time of this study. The school encompassed classes for Primary 1 (four or five year old, Kindergarten children) through Primary 7 (eleven year old, sixth grade children). There were also 40 part-time nursery (or pre-school) places within the school. School B was located in the Old Aberdeen area of the city. The catchment area for this school covered an area similar to that of School A and was in a fairly deprived inner-city location where there were many public (or state) housing tenants. A high proportion of the pupils attending this school came from multi-cultural backgrounds, and many had been born outside Britain. The school roll was approximately 283 pupils at the time of this study. The school catered for Primary 1 (four or five year old, Kindergarten children) through Primary 7 (eleven year old, sixth grade children). A nursery (or pre-school) was also located in the school. In addition, a Hearing Impairment Unit and a Language Unit were located on the premises.

Sampling Framework

The schools for this study were chosen through purposive, non-probability sampling owing to the need for a specific type of hardware to be readily available within the experimental classrooms. They could also be considered opportunistic samples.

A letter was initially sent to the Regional Education Headquarters in Aberdeen to introduce the research design and receive approval for the research.[4] A list of eligible schools was

[4]Approval in Tayside had already been sought by the Centre for Paired Learning at the University of Dundee and was granted. The present author, however, wished to seek out additional opportunities in her own region.

also requested of the Area Education Officer. Eligibility was determined basically through the availability or access to the appropriate hardware necessary to install and run the Accelerated Reader programme (one IBM compatible or one Macintosh computer). This computer needed to be available to all children in the experimental classrooms for the duration of the study. Ideally, participating schools would also have two teachers within the upper-primary school who were interested in using the Accelerated Reader. These classrooms would need to designate 30 minutes of reading practice time each day and also be willing to withhold the programme from the control classroom until the end of the evaluation period. With these criteria in mind, 11 schools in the Aberdeen Area and 4 schools in the Tayside Region were approached via mail.

Unfortunately, no school could offer an ideal situation in which there were two comparable groups of children (i.e. children of the same age and from equal or close to equal size classrooms) for the experimental and control or alternative treatment groups. The Aberdeen schools mentioned in the previous section were therefore chosen to participate in the study as they most closely matched the necessary criteria for involvement in the project.

Subjects

The subjects in both schools were from either a Primary 6 (10 year old, fifth grade children), a Primary 7 (11 year old, sixth grade children) or a Primary 6/7 composite classroom. For Project A, the Experimental classroom consisted of 27 pupils in Primary 7. The Control group consisted of 12 Primary 7 children from a Primary 6/7 composite class. For Project B the Accelerated Reader experimental classroom consisted of 24 children in the Primary 7. The Alternative Treatment classroom consisted of 26 Primary 6 children.

Hypotheses

The following hypotheses were developed for the two projects in this study

Project A

1a The Accelerated Reader will be implemented to a level of at least minimal adequacy

1b If adequately implemented, the Accelerated Reader will be sufficient to result in greater reading gains (from pre- to post-test) for the experimental group than for the control group

2 Greater pre- to post-test gains in reading attitudes will be found in the Accelerated Reader experimental group than in the control group

Project B

1a The Accelerated Reader will be implemented to a level of at least minimal adequacy

1b If adequately implemented, the Accelerated Reader will be sufficient to result in greater reading gains (from pre- to post-test) for the Accelerated Reader experimental group than normally expected through regular classroom teaching

2 Pre- to post-test gains in reading attitudes will be found in the Accelerated Reader experimental group

3 No significant differences will be found between the Accelerated Reader and Alternative Treatment groups

Research Design

Two separate research projects, Project A and Project B were undertaken. A pre-post test design with a comparison group was chosen for Project A and a pre-post test design with an experimental group and an alternative treatment group was chosen for Project B. Individuals in the experimental classrooms at both schools participated in the Accelerated Reader project. In Project A, the control classroom did not participate in the Accelerated Reader intervention and was withheld from any type of intervention apart from the normal, non-computer based classroom reading programme. In Project B, the Alternative Treatment classroom participated in an alternative intervention, (described in more detail in the Implementation section).

Quantitative data was collected in Project A and Project B for both groups of children through pre- and post-testing on the Shortened Edinburgh Reading Test (1985). (See Measures section below.) In Project A, the experimental and control groups took their tests all together in one sitting. Children in Project B were administered the test in two seperate sittings, one sitting for the Accelerated Reader experimental class and one for the Alternative Treatment class. The tester was an outsider to the project hired by the Centre for Paired Learning at the University of Dundee. The current author was, however, present during all of the large group testing. The Neale Analysis of Reading Ability (1989) was also utilised in order to gain further information in terms of reading accuracy and reading comprehension pre- and post-test. A random sample of twelve children from each of the four classrooms (two in Project A and two in Project B) were tested on the Neale. This meant that in Project A, all of the controls were tested. In addition, the Elementary Reading Attitude Survey (ERAS), by McKenna & Kear (1990), was used to gain

information pre- and post-test (from all children) in terms of their attitudes to recreational and academic reading. A locally devised Interest Survey was also administered to all subjects at pre- and post-test in order to explore any changes in preferred activities (including reading) before and after the project. The present author administered the ERAS and the Interest Survey to all groups at pre- and post-test.

All of the pre-testing took place in the third week of the school year (September) and the post-testing took place six months later at the end of March before the schools dismissed for the Easter Holidays. The Accelerated Reader programme commenced in the experimental classrooms at both schools after all pre-tests had been given.

Another important aspect of this intervention was the gathering of and analysis of implementation process data. Visits and observations by the present author occurred throughout the project in both schools in order to gather this data. Additional qualitative data was gathered through the comments recorded by the classroom teachers at the end of the intervention period in reference to the progress they felt individual children had made during that time. Video recording was also undertaken in both experimental classrooms. As part of this video coverage three children and the classroom teacher were interviewed in Project A and two children and the classroom teacher were interviewed in Project B. Comments made during these interviews have been documented as process data.

In Project A, the Accelerated Reader software was installed on a Macintosh computer that was available within the classroom to all students within the experimental group. In Project B, the Accelerated Reader software was installed on an IBM compatible computer and the computer was also made available within the experimental classroom.

Measurement / Instrumentation

Shortened Edinburgh Reading Test

The Shortened Edinburgh Reading Test or SERT (1985) was administered in Project A and Project B at pre- and post-test. This group test (which does not contain parallel forms) was designed for children aged 10 years, 0 months to 11 years, 6 months. It contains four separate sub-tests, each created to measure a different aspect of reading competence. These sub-tests include Command of Vocabulary, Reading Comprehension, Understanding of Structure and Retention of Significant Detail. The Vocabulary sub-test was designed to measure the child's recognition of individual words in isolation as well as the use of contextual skills; the Comprehension sub-test the child's ability to assimilate information from written text; the Structure sub-test orientation and sequencing of letters into words and the logical sequencing of connected writing; while the Retention sub-test was designed to measure short-term memory. In addition to testing a wide sample of skills that make up reading competence, this test was also chosen as it was designed to give more detail in reference to lower ability pupils as well as challenging the better readers. In other words, there was a good range of questions to cover a wide variety of skill levels. It was also designed to be administered in one session.

The raw scores from these sub-tests were combined to obtain a total raw score. The raw score was then converted into a standardised reading quotient that could be used to compare the child with other children of his or her age based upon the standardisation sample.[5]

For the initial standardisation of this test, two samples of children were administered SERT in 1980-81. The first sample, known as the National sample, consisted of 1,164 children in England, Scotland and Wales. These children were selected randomly on the basis of

[5]Reading quotients are based upon a normal distribution with a mean of 100 and a standard deviation of 15.

birthdays and included children born during the week 5-11 April 1970 (University of Edinburgh, 1985). Testing took place over 12 months, providing an age range at testing of 10 years, 0 months to 10 years, 8 months, with a mean of 10 years, 4 months. The mean total raw score for this group was 46.06 with a standard deviation of 14.96. The second sample, was a local Edinburgh standardisation (LEA) in 1981. In this standardisation, 1,234 children were administered the test based upon a sample of 55 schools selected on the basis of size and rural/urban mix. The age range for these children was 10 years, 5 months to 11 years, 4 months with a mean age of 10 years, 10 months. The mean total raw score for this sample was 50.64 (s.d.= 14.43), which was higher than the national sample. An additional sample (n=836) was administered SERT in 1984 (again by the Edinburgh LEA) in order to confirm the information gathered from the previous samples. It is not clear from the information provided in the manual the mean age of children tested in this sample or the range in ages. The mean total raw score for this group was even higher than the earlier samples at 53.69 reading quotient points. However, the manual asserted that "the 15 regression coefficients which are used to generate the age allowance were very similar"(p21).

Reliability of the test was measured using the Kuder-Richardson internal consistency reliability indices (KR20) on the national sample (University of Edinburgh, 1985). Individual sub-test reliability coefficients showed that all but the Retention sub-test were satisfactory (Vocabulary = 0.852, Structure = 0.891, Comprehension = 0.891 and Retention = 0.765). The Standard Error of Measurement for the whole test was found to be 3.4 reading quotient points. Unfortunately, no information is provided concerning the validity of the test. However, it was felt by the researcher to have adequate face validity for its purpose.

When interpreting scores, the authors of this test advise that caution be used as the quotient is only an indication of general reading performance when the test was administered. In addition, the following points are also stressed:

- The reading quotient does not indicate total capacity for reading.
- Scores are liable to error, as in any test.
- The child's performance will be influenced by physical and mental states at the time of testing.
- Quotients relate to particular standardisation samples of children and therefore results may not fit all populations equally as well.
- Changes in reading standards over time may make the standardisation inaccurate (p14).

The Neale Analysis of Reading Ability

The Neale Analysis of Reading Ability: Revised British Edition (1989) was also administered pre- and post-test to a random sample of 12 children from each of the classrooms in Project A and Project B. This individually administered test consists of a set of graded passages of continuous prose designed to measure reading accuracy, reading comprehension and rate of oral reading. This test was chosen in the present research in order to obtain additional information on randomly selected children with regard to reading comprehension and accuracy only. There are two parallel forms, Form 1 and Form 2, each containing six passages of increasing difficulty. In the present research, Form 2 was utilised at pre-test and Form 1 at post-test.

Reading accuracy was assessed through the recording of all errors made by the child during oral reading. Reading comprehension was assessed through the use of verbally presented questions which were administered orally after the child read each passage. Scores for reading accuracy and reading comprehension were recorded in terms of reading ages based upon the standardised sample.

The different editions of the Neale Analysis of Reading Ability (1966, 1989) have been widely used in research projects (Neale, 1989; Stothard and Hulme, 1991). However,

there had been some concerns expressed regarding the previous (1966) edition of the Neale and similar concerns are now being expressed regarding the revised (1989) edition. This is particularly true in reference to the two supposedly parallel forms of the 1989 Neale (Stothard & Hulme, 1991) as well as the reliability of the test itself when compared with other similar reading tests (Gregory & Gregory, 1994). The standardisation for the second edition of the test took place in 1988 as a follow-up to the 1966 version of the test. The earlier version had been questioned in terms of the validity of the comprehension scores, the reliability of the two supposedly parallel forms of the Neale and was also considered outdated in terms of standardisation, content and language (Vincent et. al., 1983; Pumfrey, 1976, Gregory & Gregory, 1994).

The revised version of the Neale utilised a standardisation sample taken from 203 schools in England and Wales. Although this is a larger number of schools than was used in the earlier standardisation of the test, the representative nature of the schools has been questioned, as only 65.5% of the schools approached actually made returns (Gregory & Gregory, 1994). 1,760 children were sampled, of whom more children were tested on Form 1 (n=998) than Form 2 (n=762). A much smaller sub-sample of children was also administered both forms. Either Form 1 was followed by Form 2 (n=121) or Form 2 was followed by Form 1 (n=87). An analysis of the test-retest reliability for this sub-sample as recorded in the manual, states that when Form 1 was followed by Form 2 for the age group 10.00 - 11.11 years, coefficients were found of r= 86 for accuracy (n=42) and r = 87 (n=42) for comprehension. When Form 2 was followed by Form 1, coefficients were r= 95 for accuracy (n=38) and r= 85 (n=38) for comprehension. The evidence within the manual also indicates that there were very few differences in terms of the mean errors made in each passage by children on Form 1 and Form 2, making them supposedly comparable, parallel forms. These appear to be very strong claims based on the small sub-sample of children that actually took both forms. The question still remains as to whether the reliability coefficients would have been different with a larger and more varied sub-sample.

Stothard & Hulme (1991) made comments in reference to some of the "shortcomings of the revised test". They argued that Forms 1 and 2 did not appear to be truly parallel and therefore advised caution when interpreting results of studies that administered both forms using a pre-test and post-test format. In fact, they advocated using Form 1 instead of Form 2 whenever possible as, "Form 2 of the test is systematically biased against boys and suffers from an inappropriate gradation of question difficulty" (p226). In their study, in which 70 children were administered both forms of the Neale, they found that Form 2 underestimated reading ages for boys whereas there were no significant changes in scores for girls from Form 1 to Form 2.. This would therefore make it more difficult to assume that Form 1 merely provided an overestimation of reading ages, although this is not an issue which is addressed in their research. In addition, they questioned the reliability of the comprehension sub-test on Form 2 as level 5 appeared more difficult to understand than level 6 (which should have been the most difficult) for the majority of children. The claim made by Neale (1989) as to the parallel nature of the two forms is also questioned by the present author based upon results of the pre- and post-testing (particularly in terms of comprehension) from Project A and Project B. Follow-up testing was therefore conducted to further explore this issue.

Elementary Reading Attitude Survey

Attitudes toward reading were measured using McKenna & Kear's (1990) Elementary Reading Attitude Survey (ERAS). This survey consisted of 20 items requiring modified Likert scale responses. Children were asked to circle one of four pictorially presented Garfield characters that best represented how they felt about a particular statement. Each character displayed a different attitude (very happy, two more neutral intermediate positions and very unhappy). Ten of the questions related to attitudes toward academic reading and ten questions related to attitudes toward recreational reading. All questions began with "How do you feel..." and were administered orally to the children by the

present author. (Children also had a list of the questions in writing as well.) Examples of questions relating to academic reading included, "How do you feel about reading for fun at home?" and "How do you feel about going to a bookstore?". Examples of questions relating to recreational reading included, "How do you feel about reading in school?" and "How do you feel about taking a reading test?". Individual questionnaires were scored by awarding 1,2,3, or 4 points (with a '4' indicating that the happiest Garfield had been circled and a '1' that the least happiest Garfield had been circled). (See Appendix 1 for a sample copy of the ERAS.) Points can be totalled for both of the sub-scales (academic and recreational) as well as an overall total score.[6]

This survey was developed in the USA for grades 1-6 (ages 6-11) in order to provide classroom teachers with an instrument that would give an estimate of a child's attitudes toward recreational and academic reading. The pictorial design was chosen by the authors so that it would be understood by even very young children. McKenna & Kear (1990) emphasised that it should be utilised specifically to:

- Develop hypotheses regarding the attitudes of certain students
- Provide a group profile for the class
- Serve as a means of monitoring the attitudinal impact of instructional programmes (p628)

For development purposes, this questionnaire was administered to 499 elementary school children (grades 1-6) in a midwestern school district in the USA.[7] The original questionnaire consisted of 39 items, 24 related to recreational reading and 15 to academic reading. Ten items for each sub-scale were then selected on the basis of inter-item

[6] It should be noted that only the full scale total score was utilised in the analysis of data in the two present projects.

[7] Information obtained from the use of this instrument in the context of the present study did not rely on the standardisation percentages based on the US sample, but rather analysed any changes in the total raw scores from pre- to post-test to see if any significant changes were evident.

correlation coefficients. A national sample of 18,000 children in grades 1-6 was then utilised in order to obtain standardisation information. This sample formed the basis of estimates for the reliability and validity of the instrument.

Reliability was calculated through the use of Cronbach's Alpha (1951) in order to measure the internal consistency of the attitude scales at sub scale level (recreational and academic) at each grade level (McKenna & Kear, 1990). These ranged from .74 to .89. A closer analysis of the grades that correspond with the grade levels in the present study (P6 and P7) are included here. The reliability for grade 6 (P7 equivalent in Scotland) was acceptable at .87 for the recreational sub-scale, .81 for the academic sub-scale and .89 for the full scale total. For grade 5 (P6 equivalent in Scotland), the reliability was also acceptable at .86 for the recreational sub-scale, .82 for the academic sub-scale and .89 for the full-scale total.

Construct validity was measured by McKenna & Kear through several means. For the recreational sub-scale, the national sample was analysed for: 1) the availability of a public library and the ownership of a library card for that library, 2) the number of books checked out from the school library, and 3) the amount of television watched per night by each child. Results indicated that library cardholders had significantly higher recreational scale scores than non-cardholders. In addition, children who checked books out of the school library had significantly higher scores than those who had no books checked out. Also, in terms of television viewing, the 'low televiewing group' scored significantly better than the 'heavy televiewing group' on the recreational sub-scale. The validity of the academic sub-scale was determined through the examination of the relationship between scores on the academic sub-scale and reading ability, based upon the teacher grouping children into high, average and low overall reading abilities). It was found the 'high-ability' readers had significantly higher scores on this sub-scale than 'low-ability' readers (p<.39). With all of this information taken together, the present author felt there was enough persuasive evidence to support the use of the test in the present research.

Interest Survey

A locally devised Interest Survey was also utilised in attempting to measure subjects' preferences for various recreational or leisure-time activities. Ten categories were provided including, "be with my friends", "watch television", "play a sport", "play computer games", "go to the cinema", "read books", "listen to music", "watch a video", "go for a walk" and "other". The latter category was provided so that children could fill in an activity that was not included if they preferred to do so. Children were required to place a '1' by the activity which they liked the best, a '2' by the activity that they liked second best and so on. (See Appendix 2 for a copy of this survey.)

Unfortunately, there is no information regarding the reliability or validity of this test as it was not possible to carry out any pilot testing before it was administered in Projects A and B. Results from this survey therefore must be interpreted with caution.

Nature of the Intervention

The Accelerated Reader is a computerised reading management system which has its origins in the United States. It can be run on Macintosh, Apple II or MS-DOS (IBM compatible) computers. When implemented within the classroom, children select a book from the Accelerated Reader recommended book list and read it at their own pace. (At the time of writing there were only 150 titles available for the UK version of the software as compared with the 8000 in the full US version. See Appendix 3 for a list of these titles.) Each child then checks the quality of his or her comprehension of the book by taking a test on the computer. Each test consists of 5,10 or 20 questions with four multiple choice answers, typically

The computer keeps a record of results for each individual child. If the child does not achieve at least 60% on the test, then no points will be awarded. (For a review of how the point value of a book is determined, see the Background to the Accelerated Reader section in Chapter 2 under the Theory of Reading Practice.) Summary reports can be printed out for individual children or for the whole class. This summary includes the number of tests taken, the number of tests passed, average percent correct, points possible and points earned as well as the child's rank when compared with other children using the programme within the class. Children therefore receive immediate feedback on their performance. The teacher also obtains a record of a child's reading performance. Children then have an opportunity to modify their reading choices based on the feedback from the computer and the classroom teacher.

One computer report which is used in the programme is the At-Risk Report. This report can be utilised by the teacher as a diagnostic and intervention tool, as it provides " a detailed look at a variety of important indicators in a student's reading and testing history, and assigns codes to students who may be having difficulty " (Paul, Topping, & Schnick, 1995). These reports are intended to be analysed with respect to 'Accelerated Reader Points (the total number of points depending on the number of books read, how long and hard those books are and the number of comprehension questions answered correctly) as well as the At-Risk Codes. Children considered "At-Risk" by the computer are those who have a low point total in comparison with the rest of the group. They may also be those children who have a low percentage correct on the test. A list of problem types and possible causes intended to be utilised by the classroom teacher can be found at the bottom of each At-Risk Report. (See Appendix 4 for a sample At-Risk Report and Appendix 5 for a description of At-Risk Codes and possible causes as cited in Paul, Topping & Schnick, 1995.)

Implementation

Training in the use of the Accelerated Reader took place for the two Accelerated Reader experimental class teachers as well as the control and Alternative Treatment teachers in May of 1995. The head teachers of the two schools were also invited, although only one attended. All of these teachers were new to the programme and had no previous experience of working with the Accelerated Reader. An in-service was provided by two teachers from primary schools in England who had experience running the Accelerated Reader programme in their own classrooms. During the in-service presentation, the Accelerated Reader was introduced and teachers were given the opportunity to have some hands-on experience with the Accelerated Reader as well as ask questions. Teachers then had the summer holidays to read through the manuals and install the software onto their own classroom computers. Books which appeared on the UK test disks for the Accelerated Reader had to be obtained. Some of these books were ordered while others were located in the schools or made available through Regional Library Services. Each school was provided with $750 to order books by the Institute for Academic Excellence, the company which markets the programme in the US. In addition, the Accelerated Reader software was given to each school free of charge, to be kept even after the project had been completed.

Project A - Experimental Group

After the completion of the pre-testing, the experimental classroom began the Accelerated Reader intervention. A special book shelf had been set aside in the classroom which contained all of the Accelerated Reader books for the project. These books were eventually colour-coded and children were guided by the classroom teacher to the colour corresponding with the books that were within the child's independent reading level. (See Appendix 6 for a copy of the colour coding system for Project A.) Children were given

daily sustained silent reading time to read their special Accelerated Reader books.[6] Each child was supposed to record the title of the book, the number of pages read and the time spent reading during SSR in their Student Reading Logs. In addition, there was a column for the teacher to initial and to make any notes (e.g. whether the child had read with someone else or as an individual). (See Appendix 7 for a copy of this log.) Class time was also devoted to "reading to" children. During this time the classroom teacher would read one of the Accelerated Reader books out loud to the class. Children would then be allowed to take tests on the computer for that book.

Paired Reading (Topping, 1991) was also introduced in the experimental classroom through an in-service presentation in November (2 months into the project). This was done in order to provide a framework to assist certain children who were experiencing difficulties with independent reading. When the Paired Reading technique is combined with the Accelerated Reader it is known as Charing Reading (Paul, Topping & Schmick, 1995). See Appendix 8 for an overview of the Charing Reading Process as proposed by Paul, Topping & Schmick (1995). The amount of Paired Reading (or Charing Reading) engaged in by individual children was also meant to be recorded in the Student Reading Logs.

When children finished reading their books, they placed their name on a list to take a test on the computer. Individual reports were printed out each week for the child to place in his/her Accelerated Reader folder. The teacher also kept copies of each child's individual report, the classroom student summary (which gave an overview of the progress made by all students in the class) and the At-Risk Report each week.

Visits were made once a week by the present author during the first 14 weeks of the project until after the Christmas holidays. Visits were then made once a fortnight. During

[6]The agreed amount of time for SSR was 15 minutes each day although this did not occur enough. A more detailed look at the amount of time devoted to SSR can be found in the Qualitative Data Section.

each visit notes were taken in reference to how the project was being implemented, any problems that had occurred and needed to be solved and in general, the progress that was being made by individual students and the class as a whole. As Rush reports were generated and analysed at each visit. The present author spent a great deal of time explaining the As Rush reports to the teachers and what each code meant. Individual children were spoken to in reference to their progress and suggestions were made as to how improvement could be made. Eventually the teachers felt comfortable enough with the programme and felt able to speak with children individually themselves about the Studies and As Rush Reports.

Points earned using the Accelerated Reader were public knowledge in the sense that pictures of each child were placed on a special bulletin board which was called the "Wall of Fame". Individual pictures were situated next to the corresponding total point value earned by the child using the Accelerated Reader. An Accelerated Reader Shop was also made available to provide positive reinforcement for the children. Children could "trade in" their points earned through the Accelerated Reader for various prizes. In the event, the Accelerated Reader shop was opened only four times during the course of the intervention for this purpose. (See Appendix 1 for a list of prizes in the AR shop and point values required for each item.)

Project 6 - Control Group

The control children experienced regular classroom reading during the intervention period. This included 10 minutes of Sustained Silent Reading time for the duration of the project. Students read books of their own choice from the library and gave written feedback to the teacher about what they had read after completing a book. Students were then free to read about what other children had written about various books before making another book selection. Extra special books were made available for pupils of lower reading ability. No formal assessment took place concerning the books read.

Project B - Accelerated Reader Experimental Group

The Accelerated Reader experimental group undertook an intervention similar to that in the Project A experimental group. However, there were two main differences between the two groups in terms of implementation. Firstly, in Project B, children were not given the opportunity to exchange Accelerated Reader points for prizes and an Accelerated Reader Shop was not set up. Children did, however, experience public knowledge of their point totals as in Project A, their pictures were displayed next to their corresponding point total. The second main difference in Project B was that Paired Reading (Sharing Reading) was not implemented as the classroom teacher did not consider it necessary and felt it would cause too much disturbance within her class. (See also Appendix 4 for a copy of the book colour-coding system for Project B.)

Project B - Alternative Treatment Group

During the whole of the intervention period, the Alternative Treatment class was divided into three ability groups by the class teacher (i.e. "Low", "Middle" and "High"). The children read from a selection of 10 novels (which the class teacher had chosen) within their groups (non-Accelerated Reader books). The "Low" groups read for 30 minutes three times per week, the "Middle" group for 30 minutes two times per week and the "High" group for 30 minutes once each week. In addition to this, children were given 15 minutes of silent reading time every day on a novel of their choice. Children would write their name on a publicly displayed chart when they had completed a book. All reading was done out loud with the classroom teacher listening. Questions were asked about the content of the story by the classroom teacher during 'group' reading time. In addition, a variety of 'homework assignments' were given at the end of every chapter. On some books there was an in-class test which consisted of comprehension questions at the completion of the story, but most of the comprehension questions were given out as homework assignments. All assignments were compiled by the classroom teacher in quite a creative manner. They were quite varied and artistic in nature and would include such items as a

"character puzzle" (where the child had to match certain traits with a particular character), comprehension questions about the reading, or a crossword puzzle of "secret messages" which need to be decoded.

Data Analysis

In order to use a parametric test, one has to be able to assume that the background population is approximately normally distributed. Other main assumptions which must be met are that the samples are drawn at random and that the variance in the sample is similar to the variance in the background population (Johnson, 1988). As the data in this study did not strictly adhere to these criteria, non-parametric statistical analysis was utilised.

The SPSS for Windows software package (SPSS, 1995) was utilised for all quantitative data analysis. Data gathered from Project A and Project B was subjected to within-group (one group design involving before and after treatments) and between group (two group design) analyses for all measures. Within-group comparisons from pre- to post-test were made using the Wilcoxon Matched Pairs Test, a non-parametric test for two related samples. Between-group comparisons from pre- to post-test were made using the Mann-Whitney U test for two independent samples (Cohen & Holiday, 1982; Kinnear & Gray, 1994).

The Wilcoxon Matched Pairs Test ranks changes in scores (i.e. between pre- to post-test) according to their absolute magnitude. The total of the positive ranks is then compared with the total of the negative ranks. The Mann-Whitney U is a non-parametric test used to detect differences in the overall distributions between two independent samples. This test is often applied in situations where two samples are drawn from the same population but are from different 'treatments' (Rouncefield & Holmes, 1989). The level of .05 was established as the criterion for statistical significance for all analyses. In addition, all p-values calculated were two-tailed.

CHAPTER 4

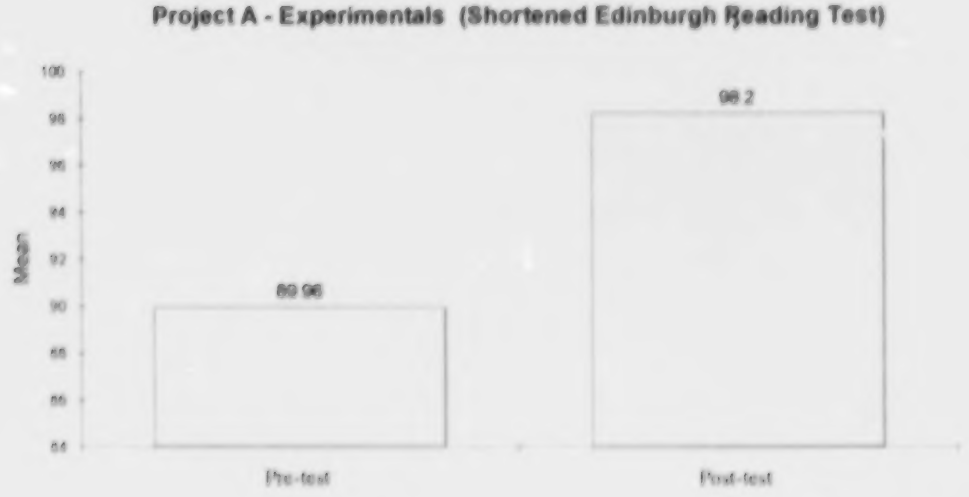
RESULTS

Quantitative Results

Project A: Experimental class

The mean age at pre-testing for the experimental class in Project A was 11 years 1 month with the range in age being 10 years 7 months to 11 years 8 months. Results of the Shortened Edinburgh Reading Test of silent reading comprehension revealed a class mean of 89.96 reading quotient points (n=27, s.d. = 11.42) at pre-test. At post-test the class mean was 98.20 reading quotient points (n=25, s.d.=11.49). This was a mean gain of 8.24 reading quotient points for the class. Using the Wilcoxon Matched Pairs test, the difference between pre- and post-test was statistically significant (Z= -3.8143, P=.0001). See Figure 1.

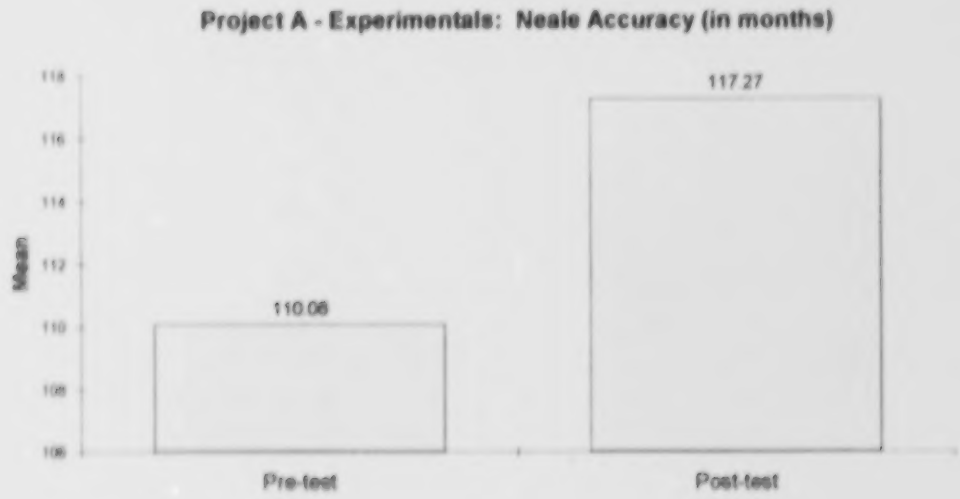
Figure 1



On the Neale Analysis, the 12 randomly selected members of the experimental group had an overall mean reading age of 110.08 months (9 years 1 month) at pre-test for reading

accuracy. This average increased by 7.19 months to 117.27 months (9 years 9 months) at post-test. Again using the Wilcoxon the difference between pre- and post-test was statistically significant (Z= -1.9876, P= .0469). See Figure 2.

Figure 2



In terms of reading comprehension on the Neale, however, this group had an overall average reading age of 105.33 months (8 years 9 months) at pre-test and 104.64 months (8 years 8 months) at post-test. This is actually a mean decrease of .69 (less than 1 month) although this difference was not statistically significant (Z= -1.0225, P= .3066).

In terms of attitudes towards reading, as measured by the Elementary Reading Attitude Survey (McKenna & Kear, 1990), the experimental group did display a small improvement in overall raw scores, as the pre-test mean was 60.77 and the post-test mean 60.87. This is a positive gain of only .10 which was not statistically significant (n=23, z=- .6430, p= .5202). However, when analysing individual changes on this survey, 17/23 children (74%) were found to show some improvement in attitudes towards reading. It is also important to take into consideration that McKenna & Kear consider a pre-post test difference of 5 points or more on a sub-scale (academic or recreational reading) or a 7-8

point difference on the total score to be a "significant" change in attitude. With this in mind, it should be noted that 8 children (35%) had improved recreational scores, and 1 of those had improved "significantly". Nine children (39%) had improved academic scores and 4 of those were "significantly" higher. Nine children (39%) had higher total scores at post-test and 3 of those were "significant".

In terms of interest in reading as measured by the locally devised Reading Interest Survey, mean interest ranking at pre-test was 6.08 on a scale of 10 (n=25, s.d. =2.23) and 5.25 at post-test (n=24, s.d. = 2.49). This is an increase of .83 in terms of average interest for the class, although this result was not statistically significant. However, when analysing individual differences within the data it was noted that 10/23 children (43%) had ranked reading more positively at post-test and that 3/23(13%) had ranked it the same from pre- to post-test. The three highest ranking activities for children at pre-test were "Being with friends", ($\bar{x}$=2.12), "Playing a sport" ($\bar{x}$=3.58) and "Watching television" ($\bar{x}$=3.96). At post-test the top three were "Being with friends" ($\bar{x}$=2.92), "Playing a Sport" ($\bar{x}$=4.21) and "Going to the Cinema" ($\bar{x}$=4.64).

In terms of gender, there were 14 girls and 13 boys in the experimental class. There were no statistically significant differences between boys and girls noted for performance at pre- or post-test for reading ability on the Shortened Edinburgh Reading Test, Neale Accuracy or Neale Comprehension. However, girls did perform better than boys (although not significantly) at pre- and post-test on all 3 measures. Girls did perform statistically significantly better than boys on the Elementary Reading Attitude Survey at pre- and post-test (p= .023 and p= .0001 respectively). Girls also scored statistically significantly better than boys (p= .029) at post-test on the Reading Interest Survey. See Figures 3 and 4. (See also Appendix 9. Table 3 for pre-to post-test results for gender for the experimental group.)

Figure 3

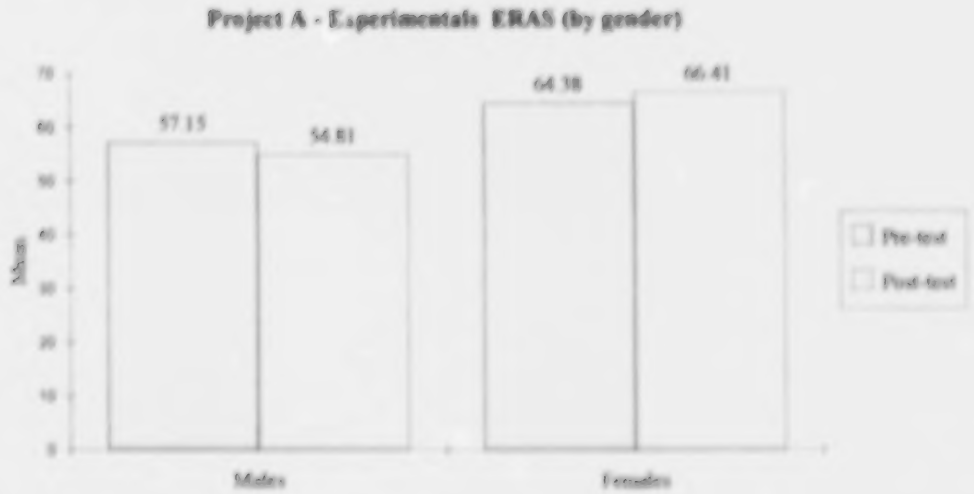
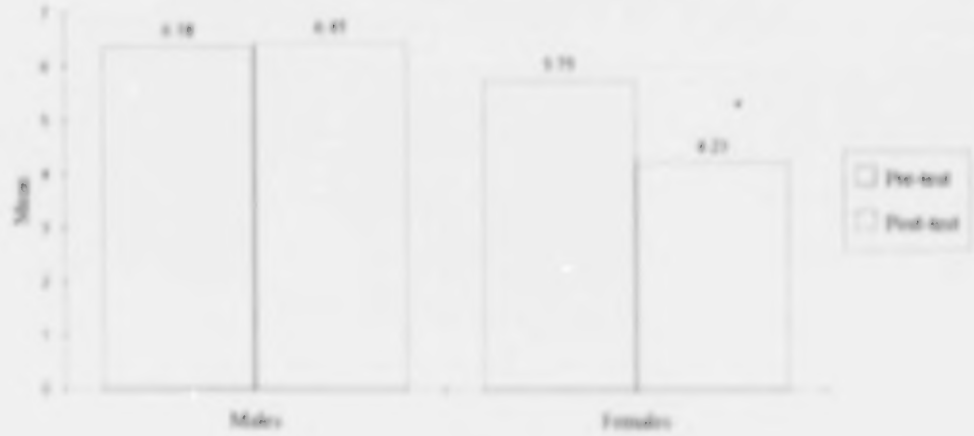


Figure 4



Project A: Control Class

The mean age at pre-testing for the control class in School A was 132.67 months (11 years 0 months) with a range of 126 months (10 years 6 months) to 138 months (11 years 6 months). On the Shortened Edinburgh Reading Test the mean reading quotient was 87.42 at pre-test (n=12, s.d. =11.38). At post-test the class mean was 90.75 (n= 12, s.d. =

10 16). This mean gain of 3 33 was not statistically significant using the Wilcoxon Matched Pairs test (Z=-1 2741, P= 2026)

On the Neale Analysis, the 12 P7 members of the control class had a mean reading age for accuracy at pre-test of 109 83 months (9 years 1 month), similar to experimentals. This decreased by 08 months to a mean of 109 75 months (9 years 1 month) at post-test. This small decrease was not statistically significant (Z= 000, P=1 0) when using the Wilcoxon Matched Pairs test. Mean reading ages for comprehension were 96 42 months (8 years 0 months) at pre-test and 84 58 months (7 years 0 months) at post-test, showing a mean loss of 11 84 months. This was a significant negative difference using the Wilcoxon Matched Pairs test (Z=-2 7848, P= 0054)

In terms of attitudes towards reading using the Elementary Reading Attitude Survey, the mean raw score at pre-test was 56 08 (n=12, s d =12 07). At post-test this mean had decreased by 1 58 to 54 50 (n=12, s d =10 63). This difference, however, was not statistically significant. When analysing individual scores it was noted that 8/12 children (66%) actually had decreased scores from pre- to post-test, while 4/12 (33%) of children displayed "significantly" improved scores. Of these children, 2/12 (17%) displayed "significantly" improved academic scores and 2/12 (17%) "significantly" improved total scores.

For the control class, interest in reading was ranked, on average, at 7 82 on a scale of 10 at pre-test (n=11, s d = 1 17) and 7 50 at post-test (n=12, s d =1 68). This positive change of only 32 was not statistically significant. When analysing individual scores it was noted that 6/12 (50%) ranked reading more positively at post-test and 3/12 (25%) ranked reading the same from pre-to post-test. The top three activities at pre-test for this class were "Be with my Friends" at (\=2 7), "Go to the Cinema" (\=3 58) and "Play Computer Games" at (\=3 58). At post-test they were "Be with my Friends" at (\=2 833), "Listen to Music" at (\=3 92) and "Go to the Cinema" at (\=4 08)

There were five females and seven males in the control classroom. No statistically significant differences were noted between genders in terms of reading performance, although females did score slightly higher than males on the Edinburgh Reading test pre- and post-test and on Neale Accuracy pre- and post-test. However, boys scored better on the Neale Comprehension test pre- and post-test. In terms of attitudes and interest in reading, there were also no statistically significant differences although girls tended to have more positive attitudes than boys. In terms of interest, girls rated reading only slightly better than boys at pre- and post-test and these differences were not statistically significant.

Project A: Comparisons between experimental and control classes

When comparing the experimental class with the control class in Project A, the Mann-Whitney-U test was applied. There was not a statistically significant difference between the two groups at pre-test on the SERT (U=140.5, Z=-.6551 and P=.5124). There was also not a statistically significant difference between the two groups at pre-test in terms of Neale accuracy (U=71.5, P=.9770) or comprehension scores (U=47.5, P=.1559). Although not a significant difference, it must be noted that the groups did differ by 9 months at pre-test in terms of comprehension. (See Appendix 10: *Table 1 for Pre-test results for Project A.*)

At post-test there were no statistically significant differences between the two groups on the SERT, nor were there significant differences between the two groups for either of the two attitude surveys (ERAS or the Interest Survey). In addition, there was not a statistically significant difference between the groups for Neale Accuracy (U=53, P=.4233), although the experimental group did improve by 7.19 months on average, and the control group decreased by .08 months. See Figure 5. However, the difference in Neale Comprehension between the two groups at post-test did reach statistical significance (U=18.5, Z=-2.9294 and P=.0033). See Figure 6. *(See also Appendix 10: Table 2 for the Post-test results for Project A.)*

Figure 5

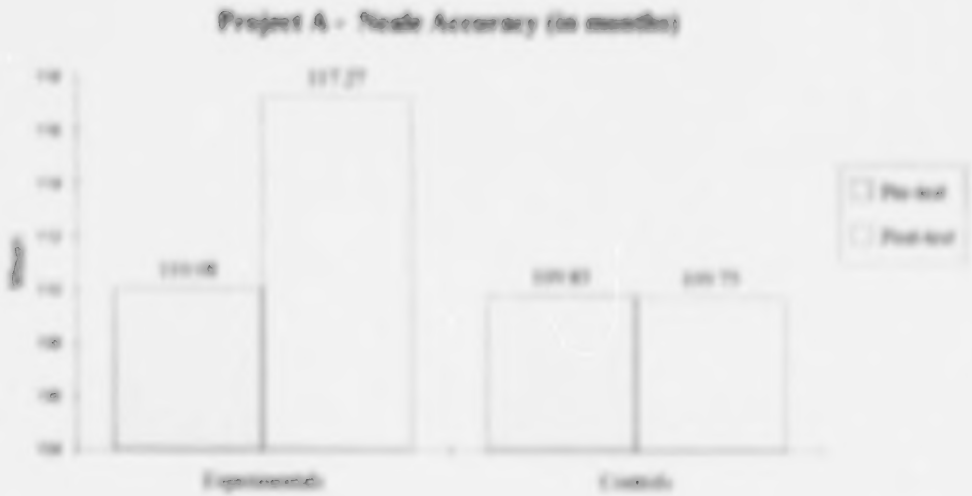
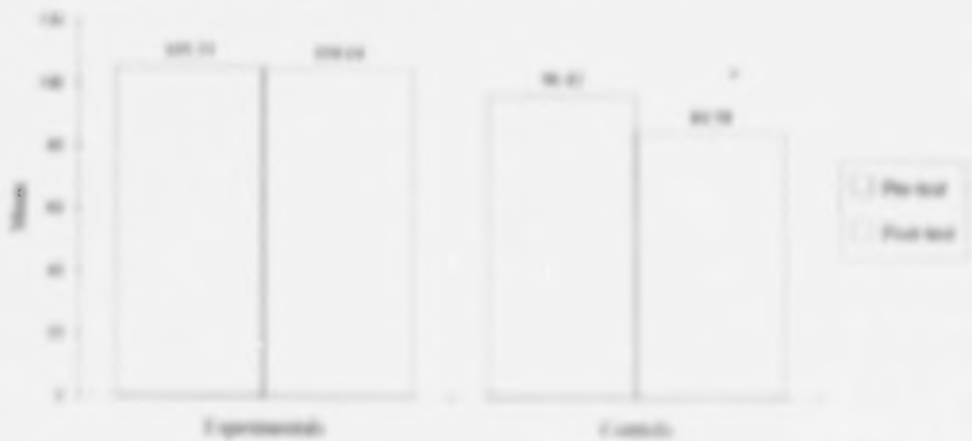


Figure 6



Although the experimental group did not improve significantly on reading comprehension, the control group had decreased significantly. These results raised concerns about the supposedly parallel forms of the Neale Analysis. A further follow-up Neale test was therefore undertaken 3 months after the post-testing. The form that had been used at pre-

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test (Form 2) was utilized again at follow-up to further explore whether the results from both forms were actually comparable. The use of the Accelerated Reader had continued in the experimental classroom during this follow-up period. The results of this follow-up study indicated that both experimental and control groups showed large gains in comprehension from post-test. The experimental group, however, remained significantly superior to the control group in terms of reading comprehension level. (See Appendix 11 for a summary of the follow-up study.)

In addition, significant gender differences emerged in the experimental class whereas they did not in the control class. At pre-test, AR girls showed statistically significantly more positive scores than boys ($p = .021$) in reading attitude on the ERAS. At post-test, the AR girls showed statistically significantly more positive scores than boys in reading attitude on both the ERAS ($p = .0001$) and the interest survey ($p = .029$). There were no gender differences found in relation to reading test scores.

Project B: Accelerated Reader 8 experimental Group

The mean age at pre-test for the Accelerated Reader experimental group in Project B was 132.71 months (11 years 0 months). On the Shortened Edinburgh Reading Test, this group had an overall class mean reading quotient of 89.46 at pre-test ($n=25$, s.d. = 19.06). At post-test the class mean was 92.59 ($n=22$, s.d. = 15.78). This was a mean reading quotient gain of 3.13 for the class. Again using the Wilcoxon Matched Pairs test, this result was statistically significant ($Z = -2.5026$, $P = .0123$). See Figure 7.

Figure 7

Project B - AR Experimental (Neurtrend Edinburgh Reading Test)

Pre-test

Post-test

On the Neale Analysis the 12 randomly selected children from the *Accelerated Reader* group had an overall mean reading age of 109 36 months (9 years 1 month) at pre-test for reading accuracy (n=11, s.d. = 24 20). At post-test the mean for reading accuracy was 112 82 (9 years 4 months) where n=11 and the standard deviation = 20 66. The average gain on this test was 3 46 months. This difference was not statistically significant (Z=-1 68, p= 0926). For reading comprehension, the pre-test class mean reading age was 96 45 months (8 years 0 months). At post-test this had increased to 107 55 months (= years 11 months), a gain of 11 10 months over the 6-month intervention period. This result was statistically significant (Z=-2 1444, P= 0191). See Figure 8.

In terms of attitudes towards reading as measured by the ERAS, the AR class rose from a mean raw score of 50 36 at pre-test to a mean of 51 43 at post-test. This was a modest mean gain of 1 47 points, which was not statistically significant when using the Wilcoxon Matched Pairs-test (Z=-1 2165, p= 2238). However, when analysing individual changes qualitatively with McKenna & Kear's (1990) 'point-scale' in mind (as referred to in Project A), it should be noted that 13/23 children (57%) had increased scores at post-test on recreational reading, 6 (26%) of these "significantly". In addition, 13/23 children (57%)

also had increased academic scores and 4 of these (30%) had increased "significantly" from pre- to post-test. In terms of total score (adding the academic and recreational scores together) 13/23 children (57%) had more positive attitudes, 9/23 (or 39%) of these "significantly"

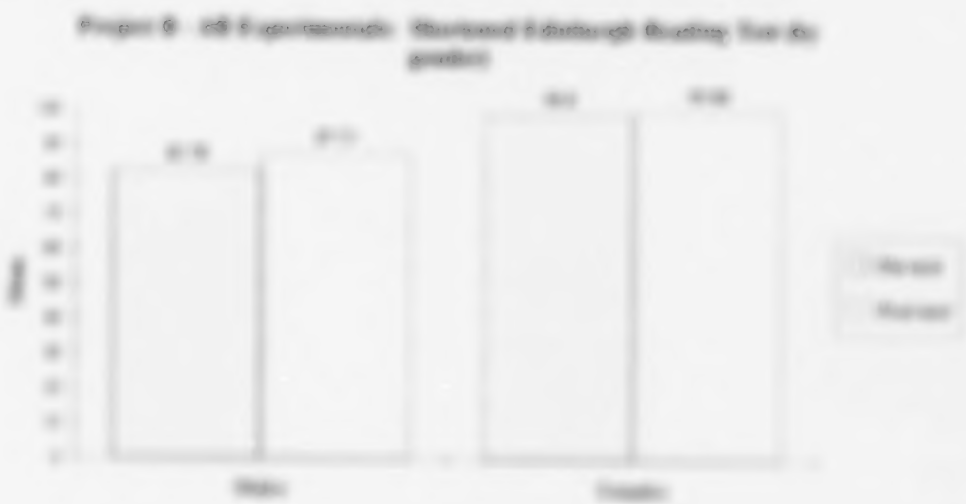
Figure 9

Mean raw score ranking on the survey of interest in reading at pre-test was 4.13 on a scale of 10. At post-test, the mean ranking was nearly the same at 4.22/10. This difference was not statistically significant. However, upon closer analysis of individual differences within the data, it was noted that 10/23 (or 43.48%) of children ranked reading higher at post-test and 5 ranked it the same. At pre-test the top three activities children rated (on average) as the ones they most liked were: "Be with my Friends" (9-1.21), "Play a Sport" (9-4.17) and "Go to the Cinema" (9-4.78), respectively. At post-test, children rated the same activities as the top three although the averages were slightly different. "Be with my friends (9-2.91), "Play a Sport" (9-1.26) and "Go to the Cinema" (9-4.61).

There were 11 girls and 14 boys in the 5/6 experimental classroom. Analysis of gender data revealed that girls performed statistically significantly better at pre-test than boys on

the Edinburgh Reading Test ($p = .0341$) when using the Mann-Whitney-U test. See Figure 9. They also performed better at post-test on this measure, although this result did not reach statistical significance.

Figure 9



Girls also performed slightly better than boys at pre- and post-test in terms of reading accuracy on the Neale and at pre- and post-test on reading comprehension (but not statistically significantly). Attitudes to reading as measured by the ERAS also indicated significantly higher scores for girls than boys at post-test ($p = .0216$) but not at pre-test. This was also true of mean ranking of stances in reading ($p = .0127$) at post-test, indicating more positive rankings for reading. See Figures 10 and 11. (See also Appendix III Table 4 for an analysis of gender differences pre- to post-test.)

Figure 10

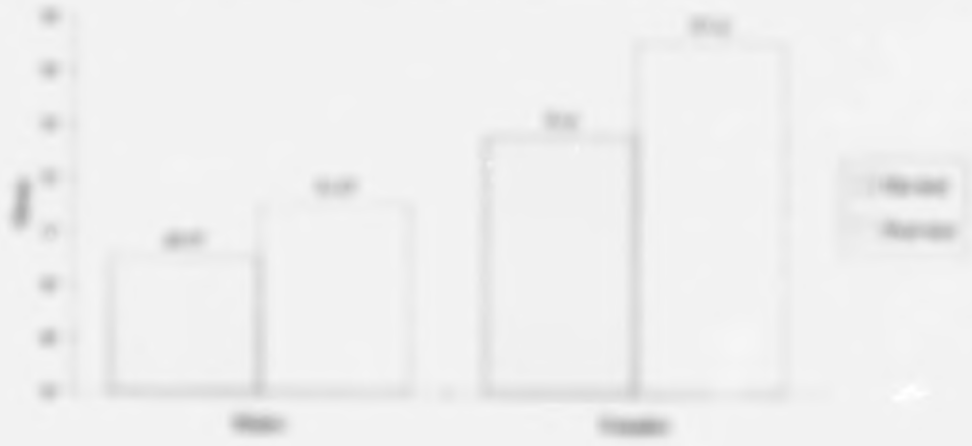
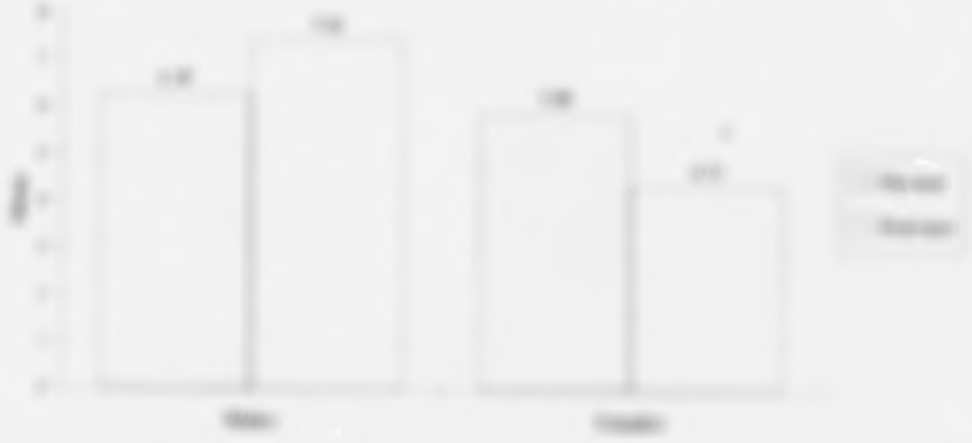


Figure 11



Project B: Alternative Treatment Group

The alternative experimental class had an overall class mean age of 120.18 months (10 years 0 months) at pre-test. Mean reading quotient at pre-test for the Wynnwood Edinburgh Reading Test was 91.97 (or 30, s.d. = 10.77). The overall class mean at post-test was 99.56 (or 30, s.d. = 10.84). This was a reading quotient gain of 6.27. Using the

Wilcoxon Matched Pairs Test this difference was statistically significant ($Z = -x$ (x*), $P = .xxxx$).

On the Neale Analysis, the (1) randomly selected members of the alternative experimental group had an overall mean reading age of (x) (x.x) months (8 years (x) months) at pre-test for reading accuracy ($n = 1$), s.d. = (x.x). At post-test the mean had increased to (x) (x) months (x years x months) ($n = 1$), s.d. = (x.x). This was an overall gain of 1 (x) months. This was not a statistically significant change from pre-post-test ($Z = -1.$ (x)(x)*, $P = .xxxx$). For reading comprehension, mean reading age was (x) (x) months (8 years 7 months) at pre-test ($n = 1$), s.d. = (x.x*). At post-test, this group showed a mean loss of (x) months to a mean reading age of (x) (x*) (8 years x months) at post-test ($n = 1$), s.d. = (x.x). This difference was also not statistically significant ($Z = -.xxxx$, $P = .x(x)(x)$).

In reference to attitudes as measured by the ESRAS, mean raw scores at pre-test was (x*.x) ($n = (x)$, s.d. = (x.x*)). At post-test the mean scores had improved only slightly to gain of x.(x) to (x).xx ($n = (x)$, s.d. = (x.x)). This difference was not statistically significant ($Z = -.(x)(x)$, $p = .xxxx$). In analysing individual scores on the ESRAS, (1)(x) children ((x)%) had increased likert/rational scores at post-test, while 1 (x) (x*) of these having improved "significantly" (Wilcoxons (x .xxx). In addition, (1)(x) children ((x)%) had increased scores at post-test in terms of 'Academic scores', 1 (x) (x*) of these having increased "significantly".

In terms of test scores on the Interest Survey in reading, pre-test scores indicated a mean rank of (x .x) ($n = (x)$, s.d. = (.)(x)). At post-test the mean rank was 1 (x) ($n = (x)$, s.d. = (.)) indicating a mean gain of (.) (x). This difference was not statistically significant ($n = (.)(x)$, $p = .(x)$). When analysing trends in individual data it was noted that 1 children (1)(x) rank(ed) reading higher at post-test, (x) (1)(x) ranked it lower and 1 (.)(x) gave reading the same rank. At pre-test the top three activities were: "Be with my friends" ($n = 1.$), "Go to the Cinema" ($n = x$) and "Watch Television" ($n = x$). At post-test, the

top three activities in terms of ratings were slightly different, with "Be with my friends" number one (x=3 15), followed by "Listen to Music" (x=4 65) and "Read Books" (x=4 8)

In terms of gender, girls (n=16) performed only slightly better than boys (n=10) on the Edinburgh Reading test at pre-test, and this difference did not reach statistical significance Girls (n=6) also performed better than boys (n=6) at post-test on reading accuracy and at pre-and post-test on reading comprehension, although this did not reach statistical significance However, for girls, attitudes to reading at post-test improved statistically significantly (p= 0096) on the ERAS whereas they did not for boys In addition, girls also had more positive mean rankings than boys for interest in reading at pre- and post-test, although these differences did not reach statistical significance (See Appendix 10 Table 5 for results of gender analysis for the AR group and the Alternative Treatment Group)

Project B: Comparisons between the Experimental and Alternative Treatment classes

In this project, the two experimental groups were engaging in two different interventions and were also different classes of children of different ages with different teachers They were thus not directly comparable However, in exploring the comparability of the two groups the Mann-Whitney test was again applied There was not a statistically significant difference between the two groups at pre-test on the SERT (U=238 5, Z=-1 4287 and P= 1531) There was also not a statistically significant difference between the two groups at pre-test in terms of Neale accuracy (U=56 5, Z=- 5851 and P= 5585) or comprehension reading ages (U=56 5, Z=- 5861 and P= 5578) despite their being of different chronological ages Although the difference in comprehension was not statistically significant, it must be noted that the groups did differ by 7 months of reading age at pre-test, in favour of the younger, Alternative Treatment class

When comparing the two groups at post-test, there were no statistically significant differences on the Shortened Edinburgh Reading Test or Neale Accuracy or Neale

Comprehension. (See Appendix 10 *Table 6* & *Table 7* for the Pre-test and Post-test scores for Project B) In addition, there were no statistically significant differences between the two groups for either of the two attitude surveys (ERAS or the Interest Survey). However, statistically significant gender differences were apparent, with Accelerated Reader girls showing better reading attitudes on both measures than Accelerated Reader boys at post-test, although not at pre-test. Additionally, Accelerated Reader girls had a statistically significantly higher mean pre-test quotient on the SERT than Accelerated Reader boys. Alternative Treatment girls showed statistically significantly better reading attitudes on one attitude measure (ERAS) than Alternative Treatment boys at post-test, although not at pre-test. No statistically significant gender differences were found in reading test scores for the Alternative Treatment class.

Qualitative Results (Process Data)

In many action research projects in field settings, the real life situation is often very different to what was planned with ideal experimental conditions in mind. The following is a list of selected diary entries that will illuminate some of the difficulties encountered during the implementation of the intervention. These must be taken into consideration when reviewing the quantitative results.

Project A: Experimental Class

September 1995 - After pre-testing had occurred, the Accelerated Reader intervention commenced. There were no major difficulties, although Sustained Silent Reading time was implemented only 15 minutes a day during this month, which was contrary to the 30 minutes originally agreed upon.

October 1995 - The At-Risk reports were explained in more detail to the classroom teacher by the present author in terms of how they could be utilised as an intervention tool. It was agreed that the present author would visit the school weekly and would model the intervention process with individual children deemed 'At-Risk' by the computer.

At this time, 70.3% of children were considered 'At-Risk'. This may have been due to the fact that many children were not reading the correct level of book for their reading ability and therefore not reading within their 'zone of proximal development'. It may have also been due to the novelty of the project and over excitement to take a test on the computer resulting in children rushing through books. By the end of October, the classroom teacher had developed a system of intervening with the difficulty level of the books and children 'At-Risk' were down to 48%. Sustained Silent Reading time continued at 15-20 minutes daily. An Accelerated Reader book was also read to the children by the class teacher as a group "serial" every day for 15-20 minutes, starting at the end of October.

November 1995 - The Accelerated Reader programme now appeared to be quite well organised. Folders had been made for individual children in which they could keep their reading logs. A colour-coded system was also now in place for the books. The book codes appropriate to individual children based upon independent reading level were eventually to be placed in the individual reading folders. It was hoped that this would alleviate some of the problems individual children were encountering when choosing books that were too difficult and then not passing the test on the computer.

The importance of 30 minutes of Sustained Silent Reading time was again emphasised and the classroom teacher agreed to fully implement this within her classroom. A training session for the class was also presented by Dr. Keith Topping and the author in reference to Paired Reading. The classroom teacher later commented that the children seemed to be excited about Paired Reading. A few had even been reading at home with someone. Also, Paired Reading time was offered in class (as part of Sustained Silent Reading time) for those that wished to utilise it. Children also expressed excitement about getting their picture on the wall and seeing it move up the point chart. The book supply situation became critical as the children were getting through the lower point books and then starting to run out of books at their individual readability level. Advantage Learning Systems (ALS) and the Institute for Academic Excellence (IAE) in the US were informed of this dilemma. Unfortunately the request for new books and test disks was not remedied initially and they did not arrive until March. In the meantime, arrangements were therefore made to order new books (additional to the Accelerated Reader list) and obtain copies of tests already made (based upon these books) through a school in England that used the Accelerated Reader, to save time for the teachers. The 'At Risk' report indicated 44.4% of children 'At Risk' by the end of the month.

December 1995 - The new books (as mentioned above) arrived, making the lack of lower-point books less problematic. As the computerised tests for these books ordered (while waiting for the US shipment) were not on the UK test disks that were obtained at the

beginning of the project, there was a new requirement to create and enter new tests onto the computer. The classroom teacher had to spend a great deal of time over the Christmas Holidays typing the tests for the new books into the computer.[1] However, although new books were ordered and new tests entered into the computer, the lack of books continued to present a major problem throughout the rest of the intervention period. The book and test disk shipment from the US was therefore anxiously awaited. During this month, students considered 'At-Risk' had decreased to 10 (35.7%). The majority of these children (7/10) were considered 'At-Risk' due to obtaining a low average percent right on the Accelerated Reader tests.

January 1995 - Notes were taken in reference to perceived student motivation, achievement and ease of use of the Accelerated Reader programme as reported by the class teacher. The class teacher spoke favourably of the programme and commented that she would like to use it again in the next academic year. In reference to motivation, she commented that the shop had only been opened once as the children did not seem very interested in obtaining extrinsic reinforcement for their Accelerated Reader points. They seemed more motivated by the actual points that they were earning and in seeing their picture move on the "Wall of Fame". In terms of student achievement, the classroom teacher commented that the children were getting through far more books than they would have without the programme. She felt, however, that the programme would have been even more effective if introduced to the children at a younger age (i.e. P1/P2).

Class "aerial" reading continued and children tended to score highly on the computerised tests after this "reading in" had taken place. The children were also now keeping a list of computer 'print outs' containing the titles of books they had read and how many points they had earned) in their folders. The class teacher reviewed what these 'print outs' meant

[1] The process of entering new tests onto the computer was described as follows in "An Accelerated Reader / Computerized Reading Management Program: Teacher's Manual (1994):

with the children, explaining the percent correct and the level of book so that children could be more aware of their progress.

The classroom teacher was reminded to keep a record of the Paired Reading (Choking Reading) which was occurring within her class. She commented that all children in the class had been doing Paired Reading and that it was too noisy. It was suggested by the present author that only those children who were having difficulty with independent reading should be encouraged to do Paired Reading in a corner of the room. This was eventually done with eight pairs of students.

Analysis of the 'At-Risk' reports during the month of January revealed that only 11 pupils (31.7%) were on the 'At-Risk' report. Closer analysis showed that 19 pupils had an overall percentage for comprehension questions above 90% and 4 pupils had an overall percentage above 90%.

February 1998 - Video recording occurred this month. (Videotape material is available on loan upon request from the present author.) Children were video recorded engaging in various aspects of the Accelerated Reader programme. These included Sustained Silent Reading, Paired Reading (Choking Reading), selecting books, looking at computer records, viewing the points they had earned as well as viewing their reading logs within individual folders. Children were also recorded viewing their pictures on the 'Wall of Fame' and looking at prizes within the Accelerated Reader shop. Interviews were also conducted with a group of three children as well as the class teacher (see later in this section).

March 1998 - This was the last month of the experimental intervention period. Additional books (requested earlier in the project) had been sent from the Institute for Academic Excellence in the US to upgrade the existing lower point book stocks and arrived during March. The children were very enthusiastic about the new books and crowded around the

teacher's desk to see which book they would choose next. The teacher commented on how exciting it was to see them so enthusiastic over new books.

The final 'At-Risk' report collected revealed that only 4 (22%) of the children were now considered 'At-Risk' by the computer. Further analysis of the At-Risk reports revealed that overall 84% of test items had been answered correctly during the intervention period. This is very close to the 85-92% correct threshold recommended by Paul et. al. (1995). In addition, 719 out of 902 tests were passed and 1,761 points were earned out of 2,481 possible (73%). The average book reading level for these P7 (11 year old) pupils, as measured by the computer, was grade 4.1 (the equivalent of the Scottish P5 or 9 year old children). The teacher's Reading Diary (which displayed the amount of time devoted to Sustained Silent Reading and class "aerial" reading each day) was also analysed and it was found that the class had spent an average of 29.45 minutes per day doing Sustained Silent Reading and an average of 28.33 minutes per day of classroom "aerial" reading, from 30 October 1995 to the end of the intervention period, nearly five months later. The impact of Shorting Reading was thought to be only minimal. Although the whole class participated in this technique, this was for a very short time. The list of children participating in Shorting Reading was cut to 8 pairs of children and soon declined to only two pairs (with Shorting practice time being allocated on only two days out of every five). Post-testing took place on the 19th and 22nd of March.

Project B: Accelerated Reader Experimental class

September 1995 - Pre-testing took place on the 7th and 14th of September with the actual intervention commencing towards the latter part of the month. Initially, there were some minor difficulties with regard to printing and the running of the software. The class teacher also had difficulty grasping the various programme functions and these had to be explained. Guidance was also provided in reference to the level of book that children should be starting with. The exact intervention procedure was also not followed by the

classroom teacher and she found the programme difficult to manage initially (i.e. she did not allocate 10 minutes of Sustained Silent Reading Time and did not monitor the children's student logs). In addition, it took several weeks to achieve the implementation of a colour coding system on the books, so that children would know which books were suitable for them. The very high number of children 'At Risk' (76.2%) at the beginning of the project was probably due, in part, to the fact that children were not guided to read the correct level of book for their reading ability and therefore were not reading within their 'zone of proximal development'.

October 2005 - Student logs were still not being kept, as the classroom teacher felt she did not have time to monitor them. Teacher monitoring and intervention with individual children were also not taking place and Sustained Silent Reading Time was being assigned only 10 minutes four days a week, as opposed to the pre-arranged 10 minutes five days a week (again due to the time issue for the classroom teacher). By the end of the month, the 'At Risk' reports indicated that 49% of children were 'At Risk'. This was a reduction from the 76.2% of children 'At Risk' two weeks previously. Colour coding for the books was now in place and the classroom teacher said she had started interviewing with the difficulty level of books chosen, although this was hard to ascertain from once weekly visits by the present researcher.

November 2005 - By the beginning of November the classroom teacher's motivation and enthusiasm for the programme began to improve, although she was still not fully committed to using the Accelerated Reader within her classroom. Suggestions for improvement were starting to be implemented, however. These included an increase in the amount of Sustained Silent Reading time allowed by the teacher to the agreed 10 minutes per day, an agreement to analyse and monitor the daily reading logs (although she still didn't find she had time), and printing off and analysing the 'At Risk' reports. Towards the end of the month the availability of the lower (1-3) and 4 point books had diminished. As a Project 4, Full-range Learning Systems (FLS) and the Institute for Academic

Excellence (UAE) in the U.K were informed of this dilemma. Unfortunately, the request for new books and text disks was not remedied initially and they did not arrive until March. In the meantime, additional books (not on the Accelerated Reader test list) had to be ordered. As the computerised tests for these books were not on the U.K. text disks that had been sent from the U.K at the beginning of the project, there was a new requirement to create and enter new tests onto the computer. The class teacher did not feel she had enough time for this and suggestions for volunteer parents or students to help with this were felt to be inappropriate by the classroom teacher. By the end of November, completed tests for the books ordered were gathered from a school in England that was also using the Accelerated Reader. These were entered into the computer by the classroom teacher in December and January.

December 1995 - The classroom teacher started taking more time to work with and understand the programme. She did mention during one of the process monitoring visits that she would have 'given up' had the present author not been coming in every week. A few individuals in the class had run out of books to read at the appropriate level. As in Project A, so many children required the lowest point value of books and therefore the demand far outweighed the supply. Although new books were ordered and new tests entered into the computer, the lack of books continued to present a major problem throughout the rest of the intervention period. As in Project A, it was not until March when additional Accelerated Reader books and disks from the U.K arrived. Despite this, the classroom teacher felt things were going 'fairly well'. Children seemed to be motivated to read, especially after they had been shown their computer generated reading records. It is interesting to note that when analysing the trend in the 'At Risk' reports, a decrease in the number of children 'At Risk' (41.7%) on 01 December, 1995 to 36.2% on 21 December, 1995) corresponded with an increase in teacher motivation, commitment and enthusiasm.

[illegible] (2003) - The classroom teacher was by this time very positive about the programme and said she would like to use it again in the next academic year. She commented, however, that it took her about four months to get accustomed to using the programme. 30-35 minutes of reading time was now being allocated each day. The class had also started some group or "aerial" reading in which the classroom teacher read a story to the class using a book from the Accelerated Reader book list, for 10 minutes once a week (this took place of the Sustained Silent Reading for that day). The classroom teacher commented that she felt the children were "improving" with regard to their reading. There were of course, a few exceptions. Some children had been complaining about the lack of books available to read. However, on the whole, the classroom teacher felt that motivation to read continued to grow. She felt the children were intrinsically motivated as they appeared to be looking more at their percentages and were more concerned about improving than than worrying about the point value of the book or where their picture was on the wall. The recording on the Reading Logs had improved. All children except two were now doing this. The classroom teacher also commented that children were by this time seemingly better at knowing what they could and could not read. Book selection by children had thus showed improvement. Analysis of the 'At Risk' report, however, revealed that only 4% were 'At Risk' at the beginning of the month. This figure had risen to 11.8% by the end of the month. It is questionable whether the classroom teacher was utilising the reports and intervening effectively.

[illegible] (2003) - The project continued at a brisk rate which the classroom teacher was comfortable. Analysis of the 'At Risk' reports revealed that six children were above the 10% correct threshold and recommendations were made for these children to increase the difficulty level of the books they were reading. The classroom teacher, however, did not feel they would be able to read harder books. The overall read for the classroom was 10% of children 'At Risk'. This was a slight improvement from the results at the end of the previous month. Video recording took place in the classroom in order to gather further

data concerning the implementation of the programme. Individual pupil interviews and a teacher interview were also conducted (see results below under the 'Interviews' sections).

March 2005. This was the last month of the intervention period. The zero books (from the 0.9 Reality) arrived. The 'Real' Ye Rule' reports revealed that 4% of children were still considered 'Ye Rule' by the computer. Despite this, the classroom teacher felt that nearly all of the children had improved in some way and that their percentages (based upon the number correct on each block) continued to go up. It was hoped that the zero books would help to reduce the number of children on the 'Ye Rule' report even more. Further analysis of the 'Real' Ye Rule' report revealed that, on average, 89% of the tests had been answered correctly during the intervention period. This, again, is very close to the **Accelerated Reader** 90-95% correct desired threshold. In addition, 210 out of a total of 761 tests taken were passed. Points earned by the class totalled 1991 out of 1914 possible (104%) and the average book reading level for this 6th class (11 year old children) was grade 7.4 (the Scottish equivalent of P7 is 9 to 10 year old children). Post-testing occurred over the 24th and 31st of this month. No information was available in terms of the average amount of time spent reading by the children in the class as the teacher did not keep a running note of this (although she had been asked to do this).

Interviews

It is also important to look at more open ended ways at the perceptions and feelings of the pupils and the teachers that took place in the Accelerated Reader project. The following are selections from a list of initial pupils and teachers and a Project 1 and Project 2 to the interviews held during the initial successful process.

Students

Q: What do you like about the Accelerated Reader?

"I've got to read all kinds of books. Some of the books are really exciting."

"I like it because it helps you on the reading. You get to choose your own books up until."

"I like it because it teaches you how to listen to read. It teaches you things about how stories and things."

"It gives me a chance to read different kinds of books. I like having quiet time just to read books to myself."

"I never really used to read books that were I do, because I can do it by myself now. I don't need to get help now."

Q: What do you think about taking turns on the computer?

"Well, I think it is better than taking turns on paper."

"It's okay but I like it when you just read a book."

"It depends what book it is because if you fail it is not really good. Boy, the computer is really good to work on because if you just had a piece of paper it would get lost so it is good to have it on the computer."

"Well, I do like it. I like going to the computer to take a turn."

Q: Do you think you have become a better reader since using the Accelerated Reader?

"I've read more books now than I did before."

"I think I'm become faster at reading than I was before. Now I am a better reader."

"Probably because it is like learning as something."

"Before I started, well I was a good reader but not as good as I am now. It has really helped me a lot."

"I used to be in one of the lower reading groups but now I am pretty high up on the reading score. So, yes it has helped a lot."

Teachers

Q: Were the children in your classroom exposed using the Accelerated Reader?

"Yes, it is giving them a lot of fun. They have thoroughly enjoyed it. They have enjoyed participating using the computer after they have read a book. Taking the quiz on the computer has stimulated them and also the fact that they can then move on the craft of them that are moving up the book cycle motivating."

"Definitely. they have enjoyed using the computer to answer the questions rather than writing things down. They like the marking or their progress and seeing the percentage and trying to get that to go up. more so than the photograph going around the craft club poster. They are really striving now for percentages."

5) Are the students in your class more motivated to read?

"Oh definitely, definitely, they read more and some of them will take a book home. In fact one or two of them are taking it it books home, rather than just use it in class. They are definitely trained."

"They are definitely more motivated than before. More than 50% are reading a lot more than they did before. People who read a lot before are still reading a lot. But it is mostly the ones who did not read and who did not like reading before, who have really benefited."

"I think the presentations has also improved because they are having to do it for a period of time in the library reading. That has been beneficial."

6) Why do you think has benefited the most from the Accelerated Reader?

"Well, I think they have all benefited. The good readers are beginning to read harder books than they might normally have done. The poorer readers, because they are having a set library reading time everyday are reading more and this is improving their reading and also motivating them to take the book home, the comprehension obviously is working."

"I think we have all benefited from the Accelerated Reader, especially, the poorer readers."

8) What are your feelings about having the Accelerated Reader in your classroom? Would you use it again?

"I think it has been really interesting. I have thoroughly enjoyed using it. It was a members point of view, it is really good that you can get reports produced out. The social one goes in for it a lot. It motivates the ones who like to read anyway, and also the ones who don't like to read, but can see that they are not doing as well as they could be. It is something that one might like to do again in a year or so."

"Yes, I would use it again. I think I would recommend it for poor readers. It gets them more motivated to read."

"I think I would, and it has brought books into the poorer readers own area."

[illegible] [illegible] [illegible] [

many books if she had not been working with the Accelerated Reader."

HS "A not-very able reader who tried really hard and enjoyed the challenge of the Accelerated Reader."

SK "There has been a great rivalry between 'S' and 'J'. This resulted in 'S's' mum worrying that she always had her face in a book."

DM "He's an avid reader anyway and took to the Accelerated Reader like a duck to water. He says the Accelerated Reader is brilliant!"

KC "'K' benefited from the Accelerated Reader. She read quite a large number of books at a high standard and did not fail a test."

Project B

It should be noted that a few children within this class had known reading difficulties and were attending learning support. In addition, several children in the class were learning English as a Second Language. There was no additional information available from the classroom teacher concerning the Accelerated Reader. However, a few of the individual comments made by the classroom teacher about pupils have been selected and included.

Comments about individual pupils:

SC "He hated reading but, with the Accelerated Reader, is now able to read and concentrate on what he is reading."

PF "He has made a steady improvement with reading. To begin with, he was rushing his reading and then running out of books."

SH "She has made excellent progress with the Accelerated Reader."

AM "He has also made excellent progress. 'A' attends learning support."

CV "He has shown a recent improvement as new books have arrived. He had started off trying to take too many tests without thoroughly reading the book."

PF "He has made a big improvement. He hated reading before the Accelerated Reader."

It is also interesting to add here that the classroom teacher for the Alternative Treatment group commented on how she felt that, on the whole, her class displayed a very good attitude, was very motivated and was backed up by extremely supportive parents. She also commented that she felt this situation was a very different one to that in the experimental classroom where the Accelerated Reader was in place.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

Project A

At this point, it may be useful to re-visit the hypotheses made at the beginning of the project, in summarising the results presented for Project A and Project B.

Hypotheses

For Project A the hypotheses were as follows:

1a The Accelerated Reader will be implemented to a level of at least minimal adequacy.

1b If adequately implemented, the Accelerated Reader will be sufficient to result in greater reading gains (from pre- to post-test) for the experimental group than for the control group.

1 Greater pre- to post-test gains in reading attitudes will be found in the Accelerated Reader experimental group than in the control group.

In analysing the results of the pre-tests for Project A, it was noted that the control and experimental groups appeared to be comparable as both groups had nearly identical mean chronological ages at pre-test as well as similar pre-test scores on 3/3 of the reading measures (the Shortened Edinburgh Reading Test and Neale Accuracy). However, these

two groups displayed slightly less comparable pre-test scores on the two measures of attitude to reading (i.e. ERAS and the Interest Survey).

Analysis of the pre-test results for the Shortened Edinburgh group reading test of silent reading comprehension revealed that the Accelerated Reader group showed a statistically significant increase over the experimental period, while the control group did not. On parallel forms of the Neale the randomly selected children from the experimental group showed a statistically significant increase in reading accuracy over the experimental period, while those from the control group did not. On the comprehension scale of the Neale test, the AR group did not show a statistically significant increase, but the control group showed a statistically significant decrease, despite the fact that the groups had not differed significantly in Neale comprehension at pre-test. (See Appendix III Table 9 for gain scores for Project A.) The experimental group therefore evidenced greater gains than the control group on two out of three measures of reading achievement. However, on the third measure (Neale C comprehension) the experimental group performed statistically significantly better than controls, maintaining a higher overall mean reading age than controls, who evidenced a statistically significant decrease in post-test scores. With all of this information taken into consideration (together with the fact that the intervention had been undertaken to at least a level of minimal adequacy as stated in hypothesis (a)) it is perhaps safe to conclude that hypothesis (i) had been supported.

In terms of interest and attitudes to reading (as measured by the ERAS and the Interest survey measures), the Accelerated Reader group showed greater gains at post-test from a slightly higher baseline than the control group, although these differences did not reach statistical significance. There was, however, evidence to suggest gender differences when using the Accelerated Reader. Girls showed greater improvements in attitude than boys. Attitudes towards reading were also statistically significantly higher for girls than boys at post-test. It is also important to take into consideration the fact that despite a lack of statistically significant changes for the Accelerated Reader group overall in terms of pre- to

post-test scores on either of the attitude measures, qualitative data suggested that the children enjoyed using the Accelerated Reader and they were more motivated to read. Individual comments made by children, albeit a small sample, suggested that they enjoyed reading different kinds of books as well as choosing their own books. They also enjoyed using the computer and felt they were now better readers. The teacher, who commented on the group as a whole, felt that the children had really enjoyed using the Accelerated Reader (with the exception of one child). She also commented that the children in her class were more motivated to read and were reading more than they did before they started using the Accelerated Reader.

In summarising quantitatively, in terms of interest and attitudes towards reading, the experimental group evidenced greater pre- vs post-test gains in terms of reading attitudes than controls, with Accelerated Reader girls displaying statistically significantly better attitudes than Accelerated Reader boys. Qualitatively, there was evidence to suggest that the Accelerated Reader experimental group had improved their attitudes and motivation towards reading. With the quantitative and qualitative data taken together, it appears that hypothesis number two was also supported.

Project B

Hypotheses

For Project B the hypotheses were as follows:

Project B:

1c The Accelerated Reader will be implemented on a level of at least minimal adequacy.

H: If adequately implemented, the Accelerated Reader will be sufficient to result in greater reading gains (from pre- to post-test) for the Accelerated Reader experimental group than normally expected through regular classroom teaching.

J: Pre- to post-test gains in reading attitudes will be found in the Accelerated Reader experimental group.

I: No significant differences will be found between the Accelerated Reader and Alternative Treatment groups.

In comparing pre-test scores between the older Accelerated Reader and younger Alternative Treatment groups, it becomes evident that the Alternative Treatment group consisted of much more able readers relative to their age, as evidenced by the lack of statistically significant differences in reading age between the two groups. The Alternative Treatment group actually started the project with a higher mean quotient on the SDRT and higher reading comprehension age as measured by the Neale than did the Accelerated Reader experimental group. The Alternative Treatment group also displayed higher scores on the CM-65 at pre-test, thus further compounding the unequal baselines.

At post-test, the results of the Stanmored Edinburgh Reading group reading test revealed that both the Accelerated Reader and the Alternative Treatment group showed a statistically significant increase over the experimental period. In the case of the Alternative Treatment group, this gain was a slightly larger from a higher baseline. On parallel forms of the Neale, the 11 randomly selected Accelerated Reader and 11 Alternative Treatment children showed no statistically significant increases in reading accuracy over the experimental period, although the gain of the Accelerated Reader group was higher, from a slightly higher baseline. On the comprehension scale of the Neale test, the Accelerated Reader group showed a very large statistically significant increase from a lower baseline, while the Alternative Treatment group showed a small decrease from a much higher

baseline (not statistically significant). In general, the Accelerated Reader group improved more than the Alternative Experimental group in terms of reading accuracy and comprehension. (See Appendix H: Table 9 for a comparison of gain scores for the AR Experimental group and the Alternative Treatment group.) In addition, as the experimental group did improve statistically significantly on two measures of reading comprehension (SDRT and Neale Comprehension) from pre- to post-test (together with the fact that the intervention had been undertaken to at least a level of minimal adequacy as stated in hypothesis 1a) it may therefore be argued that hypothesis 1b was supported.

On the Elementary Reading Attitude Survey the Accelerated Reader group overall showed a greater improvement in attitude to reading than the Alternative Treatment group, from a lower baseline. On the Reading Interest Scale, however, the Alternative Treatment group showed greater improvement in attitude to reading than the Accelerated Reader group (which changed very little), from a slightly higher baseline. None of these differences reached statistical significance. However, from an analysis of gender differences, Accelerated Reader girls evidenced more positive reading attitudes than boys on both the ERAS and the Interest Survey at post-test, the differences achieving statistical significance. Alternative Treatment girls also evidenced more positive attitudes on one measure (ERAS) at post-test, the difference achieving statistical significance.

As mentioned in Project 4, it is important to take the qualitative data into consideration as well. Information gathered from the pupils and the teacher suggested that the Accelerated Reader was successful in changing attitudes towards reading in the AR experimental classroom. As in Project 4, the children enjoyed using the computer, felt they were reading more books and that they were enjoying reading different kinds of books. The teacher also commented that the children seemed more motivated to read and even displayed better concentration than was evidenced before the Accelerated Reader project commenced.

Relationship to Previous Literature

The present study has contributed in an encouraging way to the existing literature evidencing the effectiveness of the Accelerated Reader. Learning and instructional gains were found which support the findings of studies by Pratt and Sinclair (1997), McBrayer (1992) and Paul (1992, 1993 and 1994). This study also went further than other existing studies in that detailed implementations and process data were collected in addition to quantitative data. It is also an important contribution to the existing literature in that it is experimental rather than descriptive or correlational. The present author has divided this brief section into a look at the present study in relation to reading achievement and attitudes towards reading as they relate to the literature previously cited. Alternative explanations for the results will then be offered, before moving on to a critical evaluation of the methodology utilised.

Reading Achievement

The results of this study are in line with the evaluation of the Accelerated Reader by Pratt and Sinclair (1997), in which children using the Accelerated Reader displayed more than [illegible] children who had higher initial pre-test scores on Children's Assessment Tests of ICT reading tests over a five year period. It must be emphasised, however, that the Pratt and Sinclair study was an intervention which entailed the use of different measures and was conducted over a longer time period. The fact that the present study evidenced gains in reading achievement over a much shorter intervention period is perhaps encouraging especially as control group and follow up tests enabled exploration to [illegible] a Hawthorne effect is to be eliminated. The present study is also in line with the three correlational studies by Paul (1992, 1993, 1994) which suggested that the Accelerated Reader was effective in increasing the reading achievement of children. The results of the present study, which was very different in nature and methodology to Paul's study, indicated that the Accelerated Reader can be effective in increasing the reading

achievement of children in PC and PT classes even after an intervention period as short as six months and when the project has been less than fully implemented.

The fact that the majority of significant reading gains in the present study were evidenced within groups in the experimental classrooms as opposed to between experimental and control or alternative treatment groups is consistent elsewhere in the literature (NESS, 1999a). In the NESS evaluations, no significant differences were found between the experimental and control classrooms after a six month intervention period when piloting a reading software programme, albeit completely different from the Accelerated Reader, in the United Kingdom.

Attitudes to Reading

The findings of the current research project are also in line with the results of the McKnight (1995) study, which also applied a very different methodology. McKnight found that the use of the Accelerated Reader was associated with improved attitudes towards reading in remedial students in the fifth grade. While the present study found significant differences in attitudes towards reading favouring girls on quantitative measures, it must be noted that the qualitative measures (as used exclusively in McKnight's study) suggested improvements in attitudes and motivation to read for both boys and girls. In addition, when considering the love reading given to leisure time reading at pre-test and the insignificant change at post-test in the Interest Survey, in Project A and Project B in the present study, it is interesting to note that McKnight also found reading to rank very low (fifth or sixth of 10) at pre-test. Although there was an average reading for reading given at post-test, McKnight did mention that only one children had read reading as a form their second favourite activity, with the other 11 listing Television watching as their most favourite leisure time activity. Additionally, Wise (Fyfe&Wolk & Associates 1997) reviewed the ability of a variety of measures of "reading habits and dispositions". In their study of 6th/7th/8th grade children with a mean age of 12.4 years ("mostly boys without a

variety of periods and interest measures. When analyzing the various sets of cultural activities engaged in by these children, they found that watching television was the most frequent activity (87.2 minutes a day on average), with book reading appearing far down on the bottom of the list (14.2 minutes a day on average).

Gender Differences

The results of the present study indicated that girls evidenced higher scores than boys in terms of attitudes toward reading, and in some cases, the differences were statistically significant. As the earlier cited study, Rogers et. Wilkes (1991), a clear review of the literature, found that more positive attitudes toward reading in the elementary school existed to be found in girls. In addition, Lau, Sieber, & Shapiro (1972) cited many studies in which girls had been found to evidence more positive attitudes in reading than males, although their own study found no significant differences between males and females. Greaney and Hegarty (1987), in a study involving 160 fifth grade pupils, found that attitude toward reading correlated highly with gender, with girls spending more time reading books for leisure than boys.

Alternative Explanations

One of the issues that emerged in the implementation of the Accelerated Reader Lottery Project 1 and Project 2 was that of inadequate teacher observance, especially at the beginning of the project. Another issue that emerged was that of too regular assessments at the beginning of the project, particularly in Project 2. Pugh and Bennett (1991) mentioned that staff involved with the project in their organization often were not enthusiastic and committed to the project, a situation which was not experienced in the classes in the present research by the whole duration of the lasted school period. Bellingham (1992) also commented on the supportive environment and genuine enjoyment in the experimental school of the project, as well as the enthusiastic and supportive staff. The present author would like to suggest that, in the current project, there may be some

[illegible] [illegible] [illegible] [

made it more difficult to make any significant gains at post-test (i.e. a ceiling effect). One may also question whether or not children took the questionnaires seriously and answered honestly. Another factor alluded to earlier that could have affected a child's attitudes to the programme was the teacher's attitude in the classroom as well as the child's relationship with the teacher. Additionally, one may query whether or not the measures used were sufficiently sensitive, reliable and valid indicators of attitudes towards reading, especially the unpiloted Interest Survey.

Analysis of Methodology

One must be cautious in making any firm conclusions pertaining to the effectiveness of the Accelerated Reader based upon the context-specific results obtained from Project A and Project B in this study. It must be noted, first of all, that the pilot UK version of the Accelerated Reader programme was restricted in the sense that only a small number of texts were available at the time of the study. Many unforeseen difficulties also emerged during the course of the intervention period, which resulted in a less than perfect implementation of the Accelerated Reader. Therefore, although the results were encouraging one must question the extent to which threats to reliability and validity existed within the present study.

Two of the questions which inevitably emerge when analysing the validity of the study are the extent to which this study would be replicable given the same control of variables (internal validity) and the extent to which the results could be generalised to other contexts and conditions (external validity). The higher the internal validity, the more difficult it will be to achieve generalisability. Within this section, the present author would like to suggest that there were some factors that could have effected both internal and external validity. In addition, the reliability of certain measures used within the study will also be questioned.

Threats to internal validity may have included selection of the subjects and unexpected intervening events. In relation to the selection of subjects, the reader will recall that subjects in both projects were chosen through purposive, non-probability sampling, owing to the hardware requirements for running the Accelerated Reader. It may therefore be argued that it is not known how representative the school or the pupils in both Project A and Project B will be of the schools in the region let alone other regions. In terms of unexpected intervening events, a poor testing situation was evidenced in the AR class for Project B at pre-test due to a thunderstorm resulting in a class which was full of energy and more interested in looking out the window then taking a reading test. Additionally, cheating was witnessed in the Alternative Treatment group at the same school at post-test, raising questions about the validity of the test results in that class. The implementation of an alternative intervention in this class, occasioned a lack of a true non-intervention group for Project B, although the resulting comparisons had other benefits.

In querying whether the results of this study may be generalised to other schools and populations of children, it is necessary to look at the subjects, the intervention, the context and the conditions in which the study took place. The subjects in Project A came from a deprived, inner city location. There were 27 children in the experimental group and only 12 in the control group. Although the control group was small, there was evidence to suggest that the two groups were comparable, based upon mean pre-test data. The intervention itself was implemented moderately well after a slow start and the classroom ethos was good in both the experimental and control groups. In project B, the subjects also came from a deprived, inner city location. There were comparable numbers in both the AR Experimental and the Alternative Treatment groups. However, as mentioned previously, the use of an alternative intervention created a lack of a true control group. There is also evidence to suggest that a "John Henry" effect took place in the Alternative Treatment group as the classroom teacher felt determined from the outset to work hard in order to match the results of the AR experimental group. In addition, the AR intervention was implemented adequately only towards the end of the intensive treatment period. Also,

the ethos evidenced in the AR experimental group was poor whereas the ethos in the Alternative Treatment group was good. The extent to which these conditions would allow the results to be generalised across different ages and groups of children within different contexts is therefore questionable.

Threats to reliability were evidenced mostly in relation to the sensitivity of various measures used. For example, there was some evidence to suggest that floor and ceiling effects existed in Project B for the Shortened Edinburgh Reading test, which may have resulted in an under-estimation of gains in the Accelerated Reader groups as well as exaggerated pre- to post-test gains for the Alternative Treatment group. In the AR experimental group there were two pupils who were already too old for the test at pre-test therefore making their pre- to post-test scores unreliable. In the Alternative Treatment group, there were 10 children who were too young for the test at pre-test. As the scores for these children were pro-rated backwards, any error would more than likely have been an underestimation of the child's true score. Therefore, the pre-test average may have been depressed and the size of gain at post test would have been exaggerated resulting in an overestimate of pre- to post-test gains for this group. One may also question whether familiarity with the Shortened Edinburgh Reading test or practice effects could have affected the results, although this is unlikely given the six month time span between pre- and post-test. Additionally, the question regarding the reliability of the two supposedly parallel forms of the Neale emerged within the present study and has already been mentioned elsewhere. Results of the follow-up testing have suggested concerns about the reliability of the two forms, although this has not been proven. Additional research is certainly needed to further evaluate this question. Another measure which one could question is that of the locally devised Interest Survey. As no pilot test was carried out with the instrument, its true reliability within the context of this study was not determined in advance and results should therefore be interpreted with caution.

In concluding, it is notwithstanding the Alternative Explanations and the Analysis of Methodology sections that the previous conservative conclusions in relation to the hypotheses are felt to have been supported.

CHAPTER 6

ACTION IMPLICATIONS

Cost-Effectiveness

One of the issues that is interesting to analyse in a study involving a particular intervention is that of cost-effectiveness. It is often difficult, however, to provide any precise criteria by which to judge this. The National Council for Educational Technology (1994b) would argue that computer-assisted learning, in general: 1) is cost effective as a device for record-keeping, reporting and analysis when compared with "paper-based systems", 2) is efficient in that it provides new opportunities for test delivery and can save time while maximising student performance, 3) provides greater clarity and precision in reference to the criteria for assessment, and 4) accountability is high as it provides rapid feedback to staff and students. Davidson & Noyes (1995) also propose that computers would be cheaper than teachers in the long run for providing extra long-term practice. However, they also argue that the initial cost of the technology makes it necessary to evaluate the effectiveness of the use of computers with various groups of learners in order to maximise the benefits. Additionally, Peak & Dewalt (1992) in their evaluation of the Accelerated Reader briefly mention the cost-effectiveness of the programme and state that "some may argue that the initial expense of this programme does not perhaps warrant the results, but time should prove this investment noteworthy if scores are maintained at the current level or continue to rise" (p9).

In this study, the issue of cost-effectiveness is a question which will depend largely on the underlying objectives for the use of the Accelerated Reader. For example, it may be utilised on an individual classroom basis or as an extended project which may cover several classrooms or it may even extend to a much wider entire school programme. There are several ways in which one may wish to examine the cost- effectiveness of the Accelerated Reader. These may include: 1) the cost-effectiveness of the intervention as operated in the

present research, 2) the start-up costs another school might incur if running the programme and 3) how this would relate to running costs in the USA.

The use of the AR in Project A and Project B was arguably quite cost-effective for the two schools involved. The initial costs of the AR software, including the tests for the 150 UK titles for AR books and $750 for up-grading existing book stocks, were provided by Advantage Learning Systems (ALS) and the Institute for Academic Excellence (IAE). In addition, the costs of the one-day training session for teachers as well as the standardised testing materials necessary for pre- and post-testing were covered by a Nuffield Foundation research grant. Additional software (including more test disks and an up-grading of the AR software) as well as 20 additional books of lower point value for each school were provided by ALS and IAE. Both schools also already had the appropriate computer hardware available to run the AR in each of the AR experimental classrooms. In determining the cost-effectiveness of the AR in Project A and B, the effectiveness of the intervention must also be taken into consideration. Despite the restricted nature of the UK pilot version, the insufficient AR books available, minimal training for teachers and lack of proper implementation, the use of the AR programme did provide some encouraging results which would point to the effectiveness of the AR. While the Alternative Treatment group in Project B also experienced some positive effects, it may be argued that these results were not as good as those in the AR group. In addition, the alternative intervention was very labour intensive for the teacher, thus raising questions as to its cost-effectiveness and whether it could be replicated.

If another school desired to run a similar intervention to the one undertaken in these two studies, the UK version of the AR (for one classroom) would need to be purchased. Other initial costs to the school would vary according to the provisions already available within the school. For example, computer costs will depend on the availability of the appropriate computer hardware. Book costs will similarly vary according to the number of AR books already in the school. Other costs which the school may incur would include costs for

training, student achievement tests (if comparing scores in a pre- to post-test design), computer supplies (i.e. paper) and maintenance of the computer over time, additional book supplies (when the initial book stocks have been depleted) and incentives or prizes for the AR shop (if utilised). If schools purchase the AR to be used in this way, decisions can then be made in reference to the future use of the AR in the school (which may include expansion to other classrooms or even use on a school-wide networked basis).

The cost of running the full version of the Accelerated Reader in the US will vary from the UK version of the programme at the present moment. Therefore, until the UK version of the AR is developed and expanded, a full breakdown of the running costs for a full implementation of the AR as it is known in the US will not be possible. A breakdown of running costs in a US context is provided in Paul, Topping & Schnick (1995) but will not be mentioned in detail here. However, in working through an overview of costs, these authors mention the many options available for funding the programme in a US context. These include fund-raising through parent, student and civic groups, support from individuals in the community (including corporate and business funding), and grant money. It is unclear, however, the extent to which such approaches would be attainable in a UK context.

Future Research

Further studies concerning the effectiveness of the Accelerated Reader both within a US and a UK context are needed. It may be interesting to focus on variation in terms of the amount of Sustained Silent Reading time within the classroom and the effect this has on reading achievement. Variation in the quality of implementation, including active teacher response to At-Risk reports and better management of children reading within their zone of proximal development (as indicated by the 85-92% correct threshold on AR tests) may also be useful. Further research will also be necessary in reference to an expanded UK version of the AR which would include more books and tests. It would also be beneficial

to have some information regarding experimentation using different measures of reading comprehension and attitude. It may also be useful to examine variations in different age groups of children using the AR as well as the extent to which gains might increase over a longer intervention period and whether these gains can be sustained over time. It may also be interesting to further analyse the extent to which gains in reading might cross over to other subject areas such as mathematics.

In addition to these areas, it may be advantageous to further analyse any gender differences that emerge when using the Accelerated Reader. It may also be exciting to experiment further with the effectiveness of public display versus private self-recording of Accelerated Reader performance. Further, the effects that the well-implemented and consistent use of Duolog reading (with the Accelerated Reader) has on reading gains as well as the effectiveness of other forms of reading to and with students would be beneficial. It may also be interesting to analyse behavioural gains, if any, that are made through the use of the Accelerated Reader, as well as to analyse the progress that special groups (i.e. those with special educational needs) encounter through the use of the programme. Finally, a comparison of the effectiveness and cost-effectiveness of the Accelerated Reader in relation to other alternative treatments is also needed.

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APPENDICES

1 Elementary Reading Attitude Survey

2 Interest Survey

3 Titles available for the UK Version of the Accelerated Reader

4 Sample 'At-Risk' Report

5 Problem Types and Possible Causes (found on the 'At-Risk' Reports)

6 Colour-Coding System for Project A and Project B

7 Student Reading Logs

8 Duolog Reading Process

9 Accelerated Reader Shop Prizes

10 Tables 1-9

11 Follow-up Study for Project A

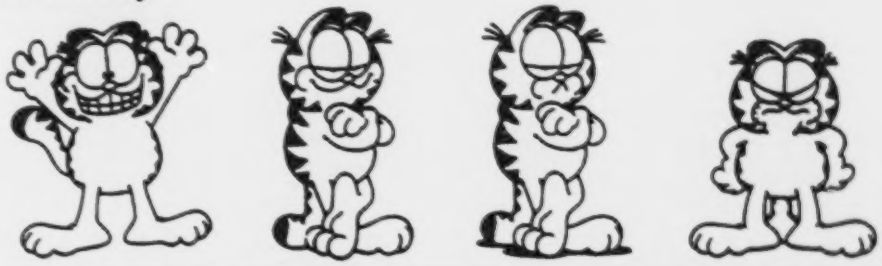
APPENDIX 1

Elementary Reading Attitude Survey

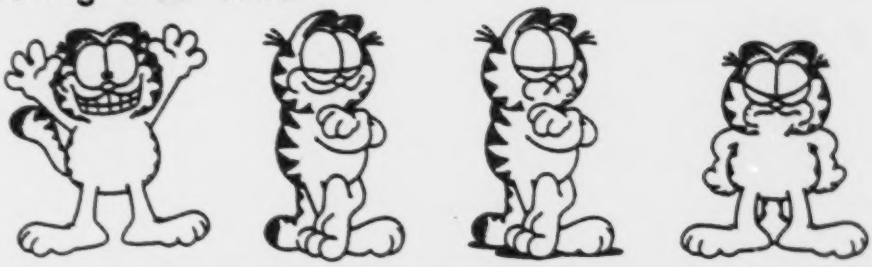
READING ATTITUDE SURVEY

Name_____

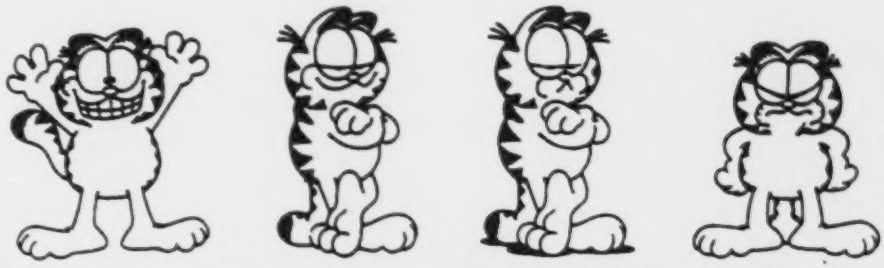
1. How do you feel when you read a book on a rainy Saturday?



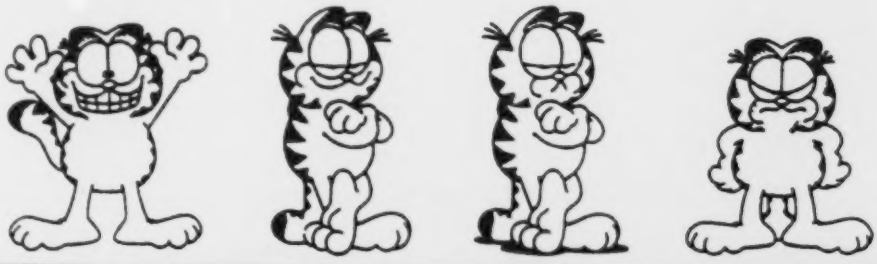
2. How do you feel when you read a book in school during free time?



3. How do you feel about reading for fun at home?



4. How do you feel about getting a book for a present?



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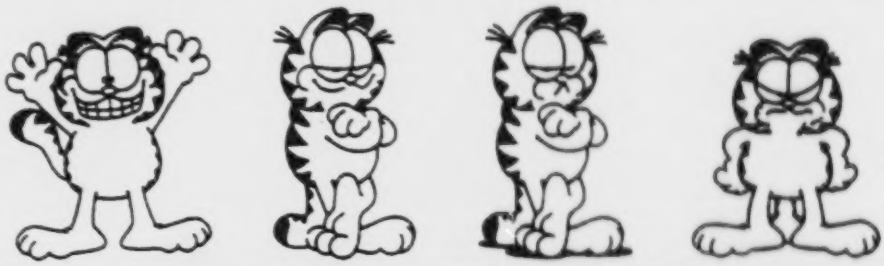
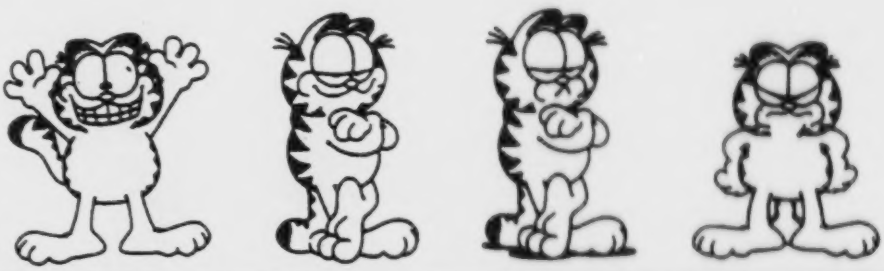
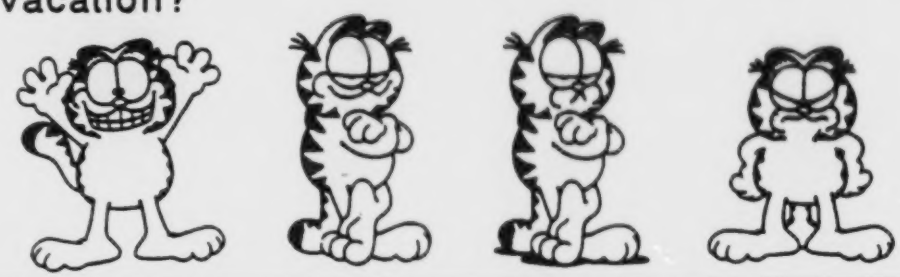
5. How do you feel about spending free time reading?



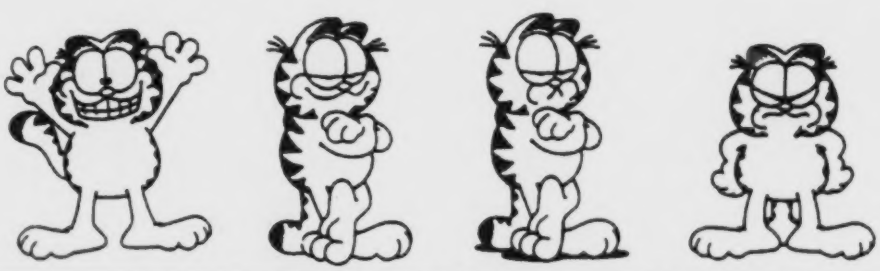
6. How do you feel about starting a new book?



7. How do you feel about reading during summer vacation?



8. How do you feel about reading instead of playing?



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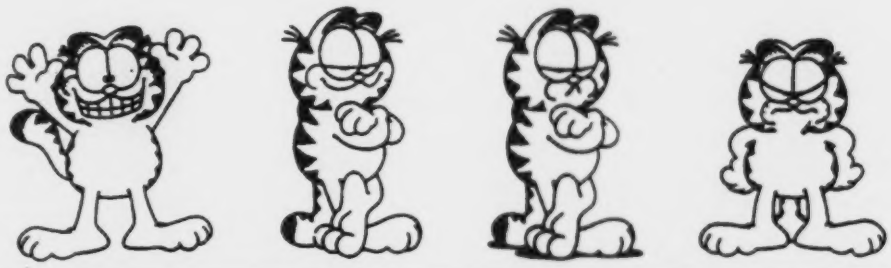
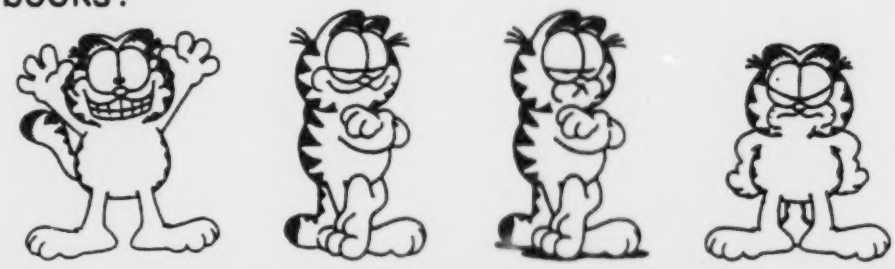
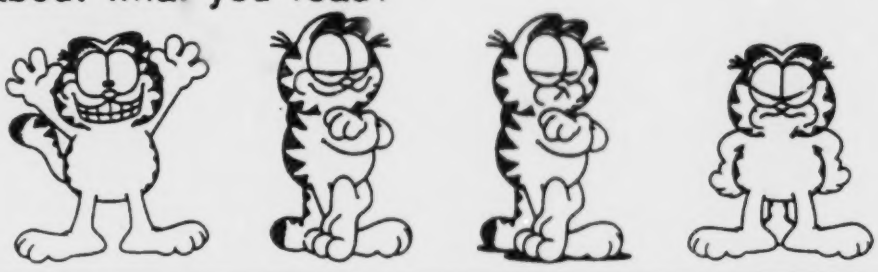
9. How do you feel about going to a bookstore?



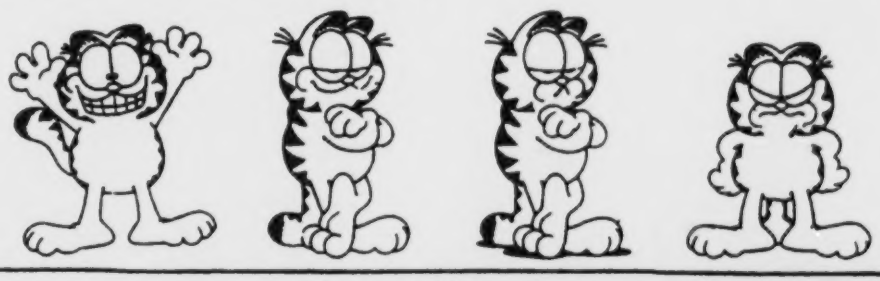
10. How do you feel about reading different kinds of books?



11. How do you feel when the teacher asks you questions about what you read?



12. How do you feel about doing reading workbook pages and worksheets?



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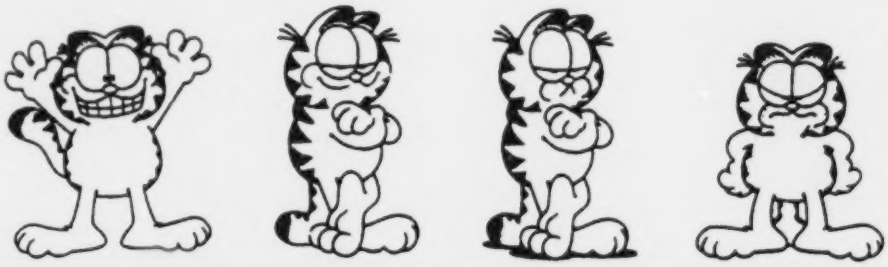
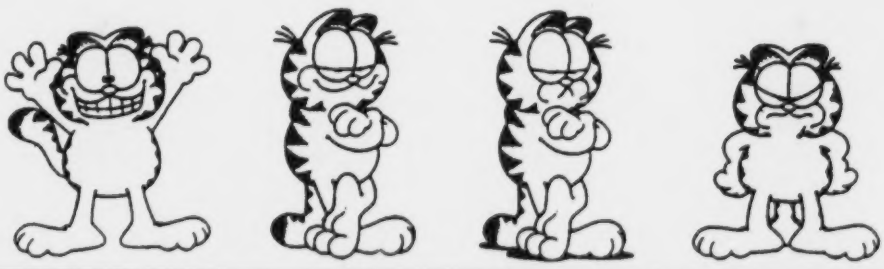
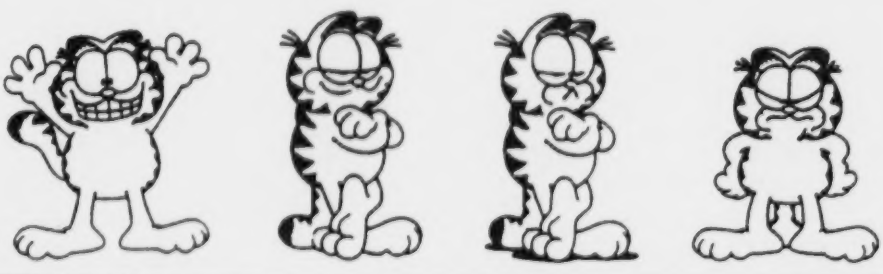
13. How do you feel about reading in school?



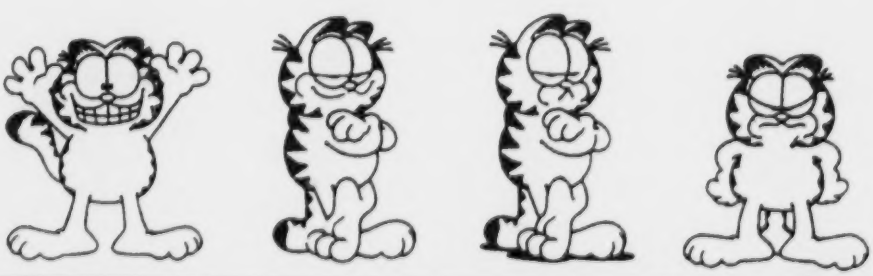
14. How do you feel about reading your school books?



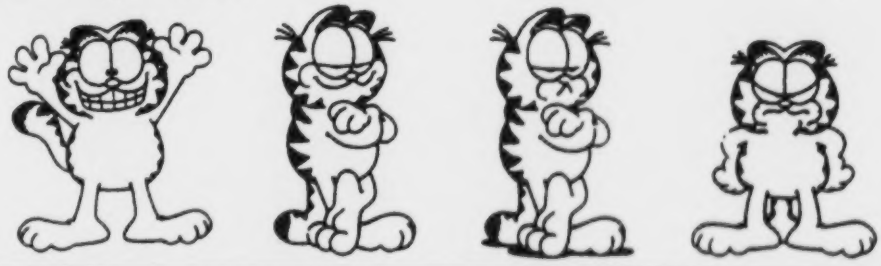
15. How do you feel about learning from a book?



16. How do you feel when it's time for reading class?



17. How do you feel about the stories you read in reading class?



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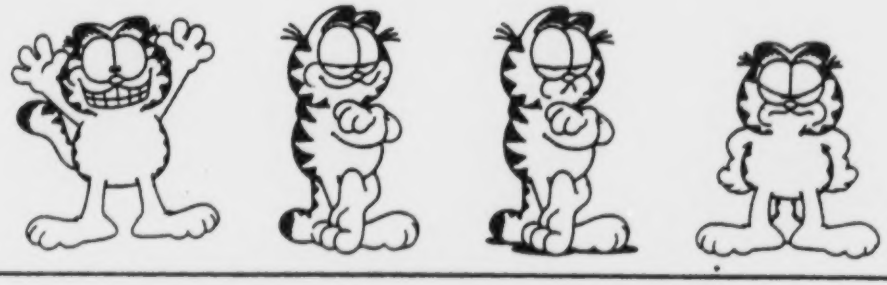
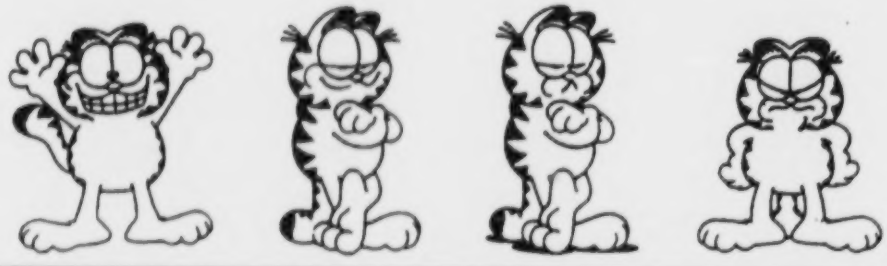
18. How do you feel when you read out loud in class?



19. How do you feel about using a dictionary?



20. How do you feel about taking a reading test?

APPENDIX 2

Interest Survey

Name:_____

Teacher:_____

Date:_____

What do you like to do?

1 = This is what I like to best.
2 = This is what I like to do second best.
3 = This is what I like to do third best.
4 = This is what I like to do fourth best.
5 = This is what I like to do fifth best.
and so on

_____ Be with my friends

_____ Watch television

_____ Play a sport

_____ Play computer games

_____ Go to the cinema

_____ Read books

_____ Listen to music

_____ Watch a video

_____ Go for a walk

_____ Other: _____

_____

_____

APPENDIX 3

Titles available for the UK Version of the AR

rrently installed tests by title.

est	Title	Author	Level	Points
661	18th Emergency, The	Byars, Betsy	4.1	3
5452	Amazing Grace	Hoffman, Mary	3.6	1/2
4352	Beans on the Roof	Byars, Betsy	2.6	1
154	Bear Called Paddington, A	Bond, Michael	4.5	4
3642	Beware of Boys	Blundell, Tony	3.7	1/2
461	Blossom Promise, A	Byars, Betsy	4.0	3
307	Blossoms Meet the Vulture Lady,	Byars, Betsy	4.6	4
5453	Blubber	Blume, Judy	4.3	4
9113	Can't You Sleep, Little Bear?	Waddell, Martin	3.3	1/2
213	Cat Ate My Gymsuit, The	Danziger, Paula	4.0	3
9013	Cat in the Hat Comes Back, The	Seuss, Dr.	1.9	1/2
6308	Chocolate-Covered Ants	Manes, Stephen	4.9	5
311	Computer Nut, The	Byars, Betsy	4.2	4
5060	Danny and the Dinosaur	Hoff, Syd	1.7	1/2
7668	Day of Ahmed's Secret, The	Heide, Florence Parr	4.1	1
8061	Days With Frog and Toad	Lobel, Arnold	1.7	1/2
7710	Divorce Express, The	Danziger, Paula	4.8	4
5610	Everyone Else's Parents Said Yes	Danziger, Paula	4.5	3
5011	Fantastic Mr. Fox	Dahl, Roald	2.9	1
262	Freckle Juice	Blume, Judy	2.0	1
8116	Frog and Toad Are Friends	Lobel, Arnold	1.4	1/2
8467	Frog and Toad Together	Lobel, Arnold	1.4	1/2
5220	Fudge-A-Mania	Blume, Judy.	4.6	4
6117	Giant Jam Sandwich, The	Lord, John	2.6	1/2
9021	Green Eggs and Ham	Seuss, Dr.	2.6	1/2
5515	Happy Birthday Moon	Asch, Frank	1.8	1/2
174	How To Eat Fried Worms	Rockwell, Thomas	4.2	2
5022	Iggie's House	Blume, Judy	3.6	2
7732	It's an Aardvark-Eat-Turtle Worl	Danziger, Paula	4.6	4
279	Little House in the Big Woods	Wilder, Laura Ingall	3.2	4
53	Little House on the Prairie	Wilder, Laura Ingall	4.8	8
8281	Make Like a Tree and Leave	Danziger, Paula	4.2	2
7681	Market Square Dog, The	Herriot, James	4.2	1
5485	Moses the Kitten	Herriot, James	3.9	1/2
5433	My Teacher Is an Alien	Coville, Bruce	3.7	2
9033	Oh Say Can You Say?	Seuss, Dr.	3.4	1/2
979	One in the Middle is a Green Kan	Blume, Judy	1.5	1
4285	Only One Woof	Herriot, James	3.5	1
438	Otherwise Known as Sheila the Gr	Blume, Judy	3.5	3
9012	Paper Bag Princess, The	Munsch, Robert	2.9	1/2
7587	Peace at Last	Murphy, Jill	2.0	1/2
242	Pinballs, The	Byars, Betsy	4.2	3
6088	Polar Bear, Polar Bear, What Do	Martin, Bill	1.6	1/2
9281	Starring Sally J. Freedman as He	Blume, Judy	4.5	6
443	Superfudge	Blume, Judy	4.8	4
274	Tales of a Fourth Grade Nothing	Blume, Judy	3.0	4
9346	Three by the Sea	Marshall, Edward	2.5	1/2
9247	Three up a Tree	Marshall, James	2.4	1/2
5456	Very Hungry Caterpillar, The	Carle, Eric	2.6	1/2
5493	Where the Wild Things Are	Sendak, Maurice	2.9	1/2

rrently installed tests by title.

st	Title	Author	Level	Points
001	Ace: The Very Important Pig	King-Smith, Dick	5.0	3
354	Anastasia at Your Service	Lowry, Lois	6.8	4
202	Anastasia Krupnik	Lowry, Lois	6.3	4
456	Ballet Shoes	Streatfeild, Noel	6.1	8
058	BFG, The	Dahl, Roald	5.6	6
306	Blossoms and the Green Phantom,	Byars, Betsy	5.5	5
10	Borrowers, The	Norton, Mary	5.6	5
132	Can You Sue Your Parents for Mal	Danziger, Paula	5.5	5
20	Charlie and the Chocolate Factor	Dahl, Roald	6.7	5
063	Charlie and the Great Glass Elev	Dahl, Roald	5.8	5
19	Charlotte's Web	White, E.B.	6.0	5
007	Danny, The Champion of the World	Dahl, Roald	6.2	5
112	Earth to Matthew	Danziger, Paula	5.3	5
219	Gaffer Samson's Luck	Walsh, Jill Paton	5.1	4
324	Good, the Bad, and the Goofy, Th	Scieszka, Jon	5.0	2
226	Harriet the Spy	Fitzhugh, Louise	6.1	9
611	Harry's Mad	King-Smith, Dick	6.6	3
612	Horse and His Boy, The	Lewis, C.S.	5.9	8
41	Hundred and One Dalmatians, The	Smith, Dodie	6.4	8
231	Indian in the Cupboard, The	Banks, Lynne Reid	6.1	8
232	James and the Giant Peach	Dahl, Roald	7.1	4
169	Journey to Jo'burg	Naidoo, Beverley	6.6	2
132	Knights of the Kitchen Table	Scieszka, Jon	5.0	2
619	Last Battle, The	Lewis, C.S.	6.0	7
52	Lion, the Witch and the Wardrobe	Lewis, C.S.	5.8	6
522	Magician's Nephew, The	Lewis, C.S.	6.5	7
335	Maizon at Blue Hill	Woodson, Jacqueline	5.5	6
429	Matilda	Dahl, Roald	5.7	4
183	Midnight Fox, The	Byars, Betsy	6.4	3
62	Mrs. Frisby and the Rats of NIMH	O'Brien, Robert C.	5.9	9
341	Mystery of the Cupboard, The	Banks, Lynne Reid	5.7	5
240	Not-Just-Anybody Family, The	Byars, Betsy	5.0	5
342	Not-So-Jolly Roger, The	Scieszka, Jon	5.0	2
120	Phantom Tollbooth, The	Juster, Norton	7.4	7
69	Pippi Longstocking	Lindgren, Astrid	6.6	4
82	Pistachio Prescription	Danziger, Paula	5.3	4
624	Prince Caspian	Lewis, C.S.	6.3	7
509	R-T, Margaret & the Rats of NIMH	Conly, Jane Leslie	5.2	6
133	Racso and the Rats of NIMH	Conly, Jane Leslie	4.0	6
193	Remember Me to Harold Square	Danziger, Paula	6.2	5
143	Return of the Indian, The	Banks, Lynne Reid	5.3	6
744	Secret of the Indian, The	Banks, Lynne Reid	5.3	3
439	Silver Chair, The	Lewis, C.S.	5.7	8
142	Strider	Cleary, Beverly	5.8	2
410	There's a Bat in Bunk Five	Danziger, Paula	5.5	5
48	This Place Has No Atmosphere	Danziger, Paula	4.8	5
49	Tom's Midnight Garden	Pearce, A. Philippa	5.0	9
117	Voyage of the "Dawn Treader", Th	Lewis, C.S.	6.4	9
105	Wanted: Mud Blossom	Byars, Betsy	5.2	5
39	Wolves of Willoughby Chase, The	Aiken, Joan	6.8	7

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rrently installed tests by title.

est	Title	Author	Level	Points
727	Animal Farm	Orwell, George	8.8	6
203	Anne of Green Gables	Montgomery, L.M.	7.6	18
258	Begonia for Miss Applebaum, A	Zindel, Paul	7.1	6
8	Black Beauty	Sewell, Anna	7.3	10
107	Call of the Wild, The	London, Jack	7.3	6
3932	Castle in the Air	Jones, Diana	7.7	12
5650	Children of the Dust Bowl	Stanley, Jerry	6.6	6
7368	Dear Nobody	Doherty, Berlie	6.0	8
9560	Death of an Expert Witness	James, P.D.	8.5	20
530	Diary of a Young Girl, The	Frank, Anne	9.2	14
3562	Eva	Dickinson, Peter	8.1	13
6919	Fathom Five	Westall, Robert	6.5	10
737	Fellowship of the Ring, The	Tolkien, J.R.R.	7.5	34
5920	Fifteen	Cleary, Beverly	6.0	8
8564	Firm, The	Grisham, John	6.6	24
5046	Flight 116 Is Down	Cooney, Caroline B.	6.5	7
5921	Forbidden City	Bell, William	6.9	12
6388	Grace	Walsh, Jill Paton	7.7	12
367	Hatchet	Paulsen, Gary	6.1	6
7109	Hitchhiker's Guide to the Galaxy	Adams, Douglas	8.3	11
511	Hobbit, The	Tolkien, J.R.R.	7.2	17
368	Homecoming	Voigt, Cynthia	5.1	19
230	Incredible Journey, The	Burnford, Sheila	8.5	6
6324	Invitation to the Game	Hughes, Monica	5.9	7
5274	It's Not the End of the World	Blume, Judy	5.0	4
7010	Kiss the Dust	Laird, Elizabeth	7.7	12
6630	Machine Gunners, The	Westall, Robert	6.5	8
7158	Mariel of Redwall	Jacques, Brian	7.7	23
6360	Mattimeo	Jacques, Brian	7.7	23
6588	Mossflower	Jacques, Brian	7.7	23
6784	My Darling, My Hamburger	Zindel, Paul	8.8	5
531	Outsiders, The	Hinton, S.E.	6.7	8
517	Peter Pan	Barrie, James	7.7	8
5184	Red Pony, The	Steinbeck, John	5.0	5
7198	Red Sky At Morning	Wyman, Andrea	6.5	10
7139	Redwall	Jacques, Brian	7.6	23
5236	Return of the King, The	Tolkien, J.R.R.	8.9	23
136	Roll of Thunder, Hear My Cry	Taylor, Mildred D.	7.1	12
78	Secret Garden, The	Burnett, Frances	7.5	14
6985	Silver Crown, The	O'Brien, Robert	7.3	10
6942	Stranger With My Face	Duncan, Lois	6.5	8
391	Summer of My German Soldier	Greene, Bette	6.1	9
774	Tiger Eyes	Blume, Judy	4.0	6
6826	Two Towers, The	Tolkien, J.R.R.	8.6	24
5287	Walkabout	Marshall, James Vanc	7.8	5
6826	War Boy	Foreman, Michael	7.0	4
147	White Fang	London, Jack	7.7	12
715	Wizard of Oz, The	Baum, L. Frank	8.1	7
780	Wrinkle in Time, A	L'Engle, Madeleine	5.5	7
5149	Z for Zachariah	O'Brien, Robert C.	7.4	9

APPENDIX 4

Sample At-Risk Report

Accelerated Reader
At Risk Report
UNIVERSITY OF DUNDEE - LAND, SCOTLAND UK

Start Date: 01/01/95
End Date: 05/14/96
Sort Order: Last Name

Points Earned At Risk: 1/2 of median
* = Irouble value
@ = Includes tests without reading levels

Student Name	At Risk Codes	Tests Pass	Tests Taken	Avg % Right	Points Earned	Points Possible	Avg Read Level
	.R....	27	39	74.0*	47.7	85.5	3.0
	.....	23	23	93.7	101.2	114.0	6.1
	.....	22	22	69.1	44.6	81.5	4.4
	...S..	20	20	87.0	22.6*	55.0	3.2
	.....	25	25	80.7	65.6	100.0	4.0
	.R....	5	7	77.9*	34.0	64.0	4.8
	.....	26	30	83.7	133.7	180.0	5.6
	.R....	23	31	73.2*	36.1	61.0	3.5
	.....	29	29	95.3	119.3	129.0	4.4
	.....	20	22	94.5	53.9	61.5	3.7
	.....	21	22	85.5	92.5	118.0	5.0
	...S..	8	13	64.6*	8.2*	14.0	2.3
	.....	23	24	80.4	51.6	72.5	3.5
	...S..	8	8	96.2	10.9*	12.5	3.2
	.....	31	34	86.4	71.5	130.5	4.3
	...S..	19	26	62.9*	38.2	69.5	3.7
	.....	33	33	94.5	90.3	111.0	4.1
	.....	20	22	94.3	54.0	77.5	4.4
	.....	29	30	84.5	68.1	80.5	4.2
	.....	22	22	90.1	93.1	99.5	3.9
	.....	17	19	83.2	61.2	77.0	3.9
	.....	28	28	85.6	99.7	99.5	4.4
	.R....	14	18	74.1*	29.2	59.5	3.1
	.....	24	25	89.6	76.3	93.5	4.2
	.....	23	25	87.6	36.4	51.5	3.5
	.....	24	28	80.7	28.8	44.5	3.0
	.....	18	20	84.3	40.4	52.5	3.3
	.....	32	32	85.5	42.9	77.5	3.5
Patient Totals		603	681	83.3	1557.3	2211.5	4.2

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Start Date: 01/09/95
End Date: 03/14/96
Sort Order: Last Name

Points Earned At Risk: 1/2 of median
* = Trouble value
# = Includes tests without reading levels

*** Summary ***

Median of points earned.....	49.5
Total number of students.....	26
Number of students at risk.....	9 (34.6%)

Cat	# Stu	Description
A	0	No tests taken during period
B	4	Low average percent right
C	1	Very low average percent right
D	3	Low points earned
E	0	Low percent right with above median points
F	0	Very low percent right with above median points

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APPENDIX 5

Problem Types and Possible Causes

Problem Type	Description and Possible Cause
A	*No tests taken during period.* Could indicate serious deficiency or just that student is not present.
B	*Low average percent right (70-79%).* Usually means student is either reading too fast or reading at a grade level that is too high. Needs counseling or help with book selection.
C	*Very low average percent right (69% or lower).* Student is probably guessing at questions. Usually means student is not able to read independently or able to read at the level of other students. Someone needs to listen to student read to be sure book is appropriate for reading ability. Student needs lots of positive reinforcement for improved percent right. Very low test results may also indicate cheating, especially when coupled with a high number of tests taken or taking of tests on books that may also be movies or videos. Rules on cheating need to be posted and adhered to.
D	*Low points earned (points earned are 50% or less than the average for the group).* Student is doing an insufficient amount of reading. More SSR may be needed. For early readers or at-risk students who are not yet Independent readers, more adult or advanced student time may be required to read to and with student and assist with test taking. It is critical that a student achieve Independent reader status. For students who already are Independent readers, book selection could be a problem; or it could simply be that more coaching, encouragement, incentives, and standards are needed.
E	*Average or above-average points earned coupled with low (70-79%) percent right.* Students usually pushing too hard to get points and reading too fast or reading books above their level.

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F *Above-average points earned coupled with very low (under 69%) percent right.*

Student is likely guessing. Sometimes also result of cheating. Needs careful monitoring. Teachers should always review the full student record of students in this category. If the student has taken and gotten credit for any book that is also a video or movie or available in Cliff Notes, investigate with the possibility of deducting points from the student record.

APPENDIX 6

Colour-Coding System for Project A and Project B

Project A
Point Values Assigned to AR Books

Point Value of Book	Colour
1/2	Yellow
1	Yellow
2	Yellow
3	Orange
4	Orange
5	Orange
6	Blue
7	Blue
8	Blue
9	Green
10	Green
11	Green
12	Red
13	Red
14	Red
15	Red
16	Pink
17	Pink
18	Pink
19	Pink
20	Pink
21	Purple
22	Purple
23	Purple
24	Purple

Project B
Point Values Assigned to AR Books

Point Value of Book	Colour
1/2	Green
1	Red
2	Yellow
3	Blue
4	Orange
5	Brown

APPENDIX 7

Student Reading Logs

Student Reading Log

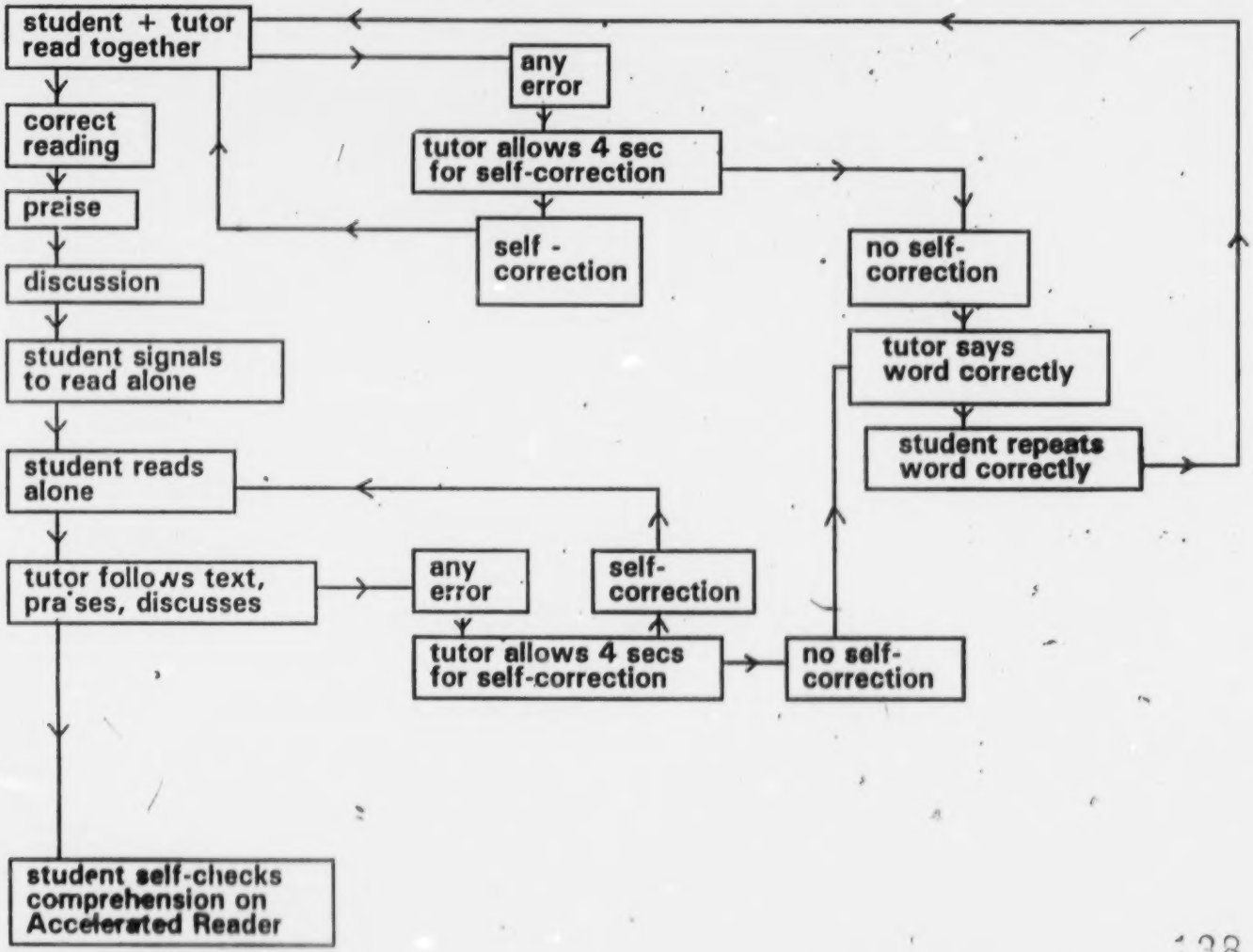
Student's Name: _____

Title of Book	Date Day/Mo	Page Begin-End	Time spent reading	Teacher Initial	Teacher Notes
	/	-			
	/	-			
	/	-			
	/	-			
	/	-			
	/	-			
	/	-			
	/	-			
	/	-			
	/	-			
134	/	-			135

APPENDIX 8

Dunlap Reading Process

DUOLOG sm READING



APPENDIX 9

Accelerated Reader shop prizes

Project A
Accelerated Reader Shop
(Point Values Required and Incentives Offered)

5 Points
Photograph on Wall of Fame
Accelerated Reader Book Mark

10 Points
Badge
Pencil
Balloon

15 Points
Rubber
Keyring
Disney Picture

25 Points
Pen
Yoyo
Address Pad
Ruler
Certificate

30 Points
Parker pen
Golf Ball
Scrap Book

40 Points
Notebook
Large Disney Figure

50 Points
Tape Measure
Game
Pack of Cards
Silver Certificate

75 Points
T-Shirt
Cap

100 Points
Backpack
Teddy Bear
Gold Certificate

APPENDIX 10

Tables 1-9

Table 1: **Pre-test scores for Project A: AR Experimental Group vs. Control Group**

	Group	Edinburgh	Nacc.*	Ncomp.*	ERAS	Interest
Mean score	Exp.	89.96	9.01	8.09	60.77	6.08/10
	Control	87.42	9.01	8.00	56.08	7.82/10
n	Exp.	27	12	12	26	25
	Control	12	12	12	12	11
s.d.	Exp.	11.42	25.07	16.34	7.93	2.23
	Control	11.38	23.88	11.16	12.07	1.17

Key:
Edinburgh = Shortened Edinburgh Reading Test
Nacc = Neale Accuracy
Ncomp = Neale Comprehension
ERAS = Elementary Reading Attitude Survey (Raw scores)
Interest = Scores for reading on the Interest Survey out of 10
s.d = standard deviation

*Nacc (Neale Accuracy) and Ncomp (Neale Comprehension) Scores are displayed in years and months throughout all of the Tables

Table 2: **Post-test scores for Project A: AR Experimental Group vs. Control Group**

	Group	Edinburgh	Nacc.	Ncomp.	ERAS	Interest
Mean score	Exp. Control	98.20 90.75	9.09 9.01	8.08 7.00	60.87 54.50	5.25/10 7.50/10
n	Exp. Control	25 12	11 12	11 12	23 12	24 12
s.d.	Exp. Control	11.49 10.16	22.33 22.00	13.49 13.98	7.61 10.63	2.49 1.68

Table 3: **Gender Differences for Project A: AR Experimental Group (Females vs. Males)**

	Gender	Test	Edin.	Nacc.	Ncomp.	ERAS	Interest
Mean	Females Males	Pre-test Pre-test	93.78 85.84	9.07 8.09	9.05 8.01	**64.38*** **57.15**	5.75 6.38
	Females Males	Post-test Post-test	100.78 94.90	10.00 9.05	9.01 8.02	**66.41*** **54.81**	**4.23*** **6.45**
N	Females	Pre-test Post-test	14 14	6 6	6 6	13 12	12 13
	Males	Pre-test Post-test	13 11	6 5	6 5	13 11	13 11

*** = statistically significant difference between Females and Males**

Table 4: Gender Differences for Project B: AR experimental Group (Females vs. Males)

	Gender	Test	Edin.	Nacc.	Ncomp.	ERAS	Interest
Mean	Females	Pre-test	**98.80***	9 04	8 02	53 60	5 88
	Males	Pre-test	**82.78**	8 10	7 11	49 07	6 28
	Females	Post-test	99 88	9 06	9 02	**57.11***	**4.33***
	Males	Post-test	87 53	9 03	8 09	**51.07**	**7.42**
N	Females	Pre-test	10	5	5	10	9
		Post-test	9	5	5	9	9
	Males	Pre-test	14	6	6	14	14
		Post-test	13	6	6	14	14

* = statistically significant difference between Females and Males

Table 5: Gender Differences for Project B: Alternative Treatment Group (Females vs. Males)

	Gender	Test	Edin.	Nacc.	Ncomp.	ERAS	Interest
Mean	Females	Pre-test	93 68	8 08	8 08	57 56	6 18
	Males	Pre-test	93 70	9 00	8 06	57 20	6 90
	Females	Post-test	100 18	8 11	8 11	**63.25***	4 81
	Males	Post-test	99 60	9 02	8 01	**49.70**	5 55
N	Females	Pre-test	16	6	6	16	16
		Post-test	16	6	6	16	16
	Males	Pre-test	10	6	6	10	10
		Post-test	10	6	6	10	9

* = statistically significant difference between Females and Males

Table 6: **Pre-test scores for Project B: AR Experimental Group vs. Alternative Treatment Group**

	Group	Edinburgh	Nacc.	Ncomp.	ERAS	Interest
Mean score	AR ALT	89.46 93.69	9.01 8.10	8.00 8.07	50.96 57.42	6.13 6.46
n	AR ALT	25 26	11 12	11 12	24 26	23 26
s.d	AR ALT	19.06 13.77	24.20 29.73	20.72 21.87	12.16 10.83	2.49 2.90

Table 7: **Post-test Scores for Project B: AR Experimental Group vs. Alternative Treatment Group**

	Group	Edinburgh	Nacc.	Ncomp.	ERAS	Interest
Mean score	AR ALT	92.59 99.96	9.04 9.00	8.11 8.06	53.43 58.04	6.22 5.08
n	AR ALT	22 26	11 12	11 12	23 26	23 25
s.d	AR ALT	15.78 15.00	20.66 28.39	26.90 26.22	8.90 12.73	2.70 3.11

Table 8: Gain Scores for Project A: AR Experimental Group vs. Control Group

	Group	Edinburgh	Nacc. (months)	Ncomp. (months)	ERS (Raw)	Interest
Mean gain	Exp Control	+8.24 3.33	+7.19 -0.08	- 0.69 -11.84	+0.10 -1.58	+0.83 +0.32
n	Exp Control	24 12	11 12	11 12	23 12	23 12
P Value	Exp Control	p< .001 NS	p< .047 NS	NS p< .005	NS NS	NS NS

Key:
NS = Not Statistically Significant

Table 9: Gain Scores for Project B: AR Experimental Group vs. Alternative Treatment Group

	Group	Edinburgh	Nacc. (months)	Ncomp. (months)	ERS (Raw)	Interest
Mean gain	AR ALT	+3.13 +6.27	+3.46 +2.16	+11.10 - 0.58	+2.47 +0.62	-0.09 +1.38
n	AR ALT	22 26	11 12	11 12	23 26	23 25
P Value	AR ALT	p<0.012 p<0.00	NS NS	p< .019 NS	NS NS	NS NS

APPENDIX 11

Follow-up Study for Project A

Summary of Follow-up Study

A further follow-up test was undertaken three months after the post-testing in order to check the results obtained from the Neale Analysis for reading accuracy and comprehension at post-test. For the follow-up testing Form 2, which was used at pre-test, was administered.

Project A: Experimentals

At follow-up, only 9 children were available for testing. Of these children, 8 had post-test data to enable comparison of gain scores. Results indicated that overall, these children (n=8) had an overall mean reading age of 116 months (9 years 10 months) at follow-up for reading accuracy. This was an average gain of 2.88 months from post-test for these children. Using the Wilcoxon Matched Pairs Test, this difference was not statistically significant. For reading comprehension, the overall mean reading age was also 118 months (9 years 10 months) at follow-up. This was an average increase of 12.38 months from post-test for this group. This difference was statistically significant ($Z = -2.3404$, $p = .0251$).

Project A: Controls

At follow-up, all 12 children were available for testing. The mean reading age for reading accuracy was 114.67 months (9 years 8 months) which indicated a mean gain of 6.92 months from post-test. Using the Wilcoxon Matched Pairs test, this difference was statistically significant ($Z = -2.8907$, $p = .0051$). For reading comprehension, the mean reading age for this group was 109.83 months (9 years 4 months) which indicated a mean gain of 11.42 months from post-test. This result was also statistically significant ($Z = -3.0594$, $p = .0022$).

Comparisons between groups

When comparing the two groups at follow-up using the Mann Whitney test, no statistically significant results emerged in terms of reading accuracy. However, for reading comprehension, there was still a statistically significant difference, favouring the experimental group ($U = 2.2$ [illegible], $p <$ .0222).

Discussion

Although the control group improved at statistically significant levels from pre-test to follow-up on both reading accuracy and reading comprehension and the experimental group improved significantly only on reading comprehension, overall the experimental group maintained a higher mean accuracy score than controls. In addition, the experimental group maintained a statistically significant superiority over the controls in terms of reading comprehension.

Conclusions

These results are encouraging and remain in line with the results of the pre- to post-testing in Project A. However, the great gains made by the experimental and controls at follow-up using Form 2 after three months since post-testing with Form 1 may suggest that the forms are indeed not parallel and comparable. Of course, there may be other explanations for these results and therefore, no firm conclusions or claims can be made. Further research will need to be carried out to further test these concerns.